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SOLID WASTE MANAGEMENT: ABSTRACTS FROM THE LITERATURE 1966

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SOLID WASTE MANAGEMENT

Abstracts from the Literature — 1966

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THE SOLID WASTE MANAGEMENT BIBLIOGRAPHIC SERIES
1941 – 1971

Since its beginning over a quarter century ago, the Federal program in solid waste management has had a number of organizational aegises, as well as several organizational titles. One constant, though, has been quite visible throughout the program's development, and that is its unflagging interest in bibliography.

Collecting past data on a problem by a literature search is the classic first step used in the scientific method of problem solving. Thus, in 1941, the first workers in the Federal program searched the world-wide literature for information that had been published on solid wastes. The resultant bibliography was then published as a service to other workers in the field and became an annual publication in the Public Health Service series. This step was taken again in 1965, following the passage of the Solid Waste Disposal Act, when the early bibliographies were reprinted and made more widely available. The literature search was then extended through 1971, and the present bibliography is one of those that will bring the series up to date.

--SAMUEL HALE, JR.
Deputy Assistant Administrator
for Solid Waste Management

SOLID WASTE MANAGEMENT
Abstracts from the Literature

1966

The Solid Waste Disposal Act of 1965 (Public Law 89-272, Title II) and its amending legislation, the Resource Recovery Act of 1970 (Public Law 91-512, Title I), authorize collection, storage, and retrieval of information relevant to all aspects of solid waste management.

The literature represented by this bibliography does not include all the 1966 solid waste literature published; 58 periodical and 51 nonperiodical titles covering both the foreign and domestic literature were screened for inclusion. No effort was made to separate strictly technical material from that which is more general. The bibliography is arranged in categories corresponding to the various administrative, engineering, and operational phases of solid waste management. Indices include subject, corporate author, and geographical location cited. Addresses of periodical sources are provided.

This project is the result of the combined efforts of the Solid Waste Information Retrieval System (SWIRS) and the Franklin Institute Research Laboratories under contracts PH 86-67-182 and PH 86-68-194. Primary SWIRS personnel involved in this project were John A. Connolly and Sandra E. Stainback.

--THOMAS F. WILLIAMS, *Director*
Technical Information Staff
Office of Solid Waste Management

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REGULATIONS (including Laws and Ordinances)

66-0001
Alplanalp, G. H. Specifications and legal responsibility. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.97-104.

The change in incinerator specifications with related changes in legal responsibility are reviewed. Potential liability of the contractor, manufacturer, and professional is demonstrated by reference to specific cases. Public competitive bidding and the use of patented equipment are discussed in depth. If plans and specifications are definite and if the contractor performs as specified, normally he will not be held to a specified performance, that is, he can't be required to perform in a specific manner and also be held for the end result. Competitive bidding statutes are to protect the public. Alternative proposals may be requested by the engineer to obtain a very favorable bid for his client. Legal liability of the manufacturer is commonly referred to as the law of products liability and the three theories of liability are: negligence, warranty or contract, and strict liability in tort. The engineer's potential liability to his client, the contractor, and other third persons is reviewed.

66-0002
Advisory board helps Illinois draft modern landfill rules. Refuse Removal Journal, 9(4):12-13, 53, Apr. 1966

The stringent regulations, created by the State of Illinois, governing the proper operation of sanitary landfills, are detailed. Under the regulations, the Health Department will supervise the operation and maintenance of all refuse disposal sites and facilities, except where there is a county, or other local health department, to enforce regulations. Neither a private nor a public organization may conduct refuse disposal operations without first registering the project with the department. A large role in the development of the rules and regulations was played by the Illinois Refuse Disposal Advisory Board. The standards to which a landfill site must adhere are outlined, including registration of plans, site approval, site improvement, and fire protection. The operating requirements specify site access, dumping area, unloading, equipment, spreading and compacting of refuse, cover material, deposition of liquids and hazardous materials, and vector control. Salvage operations are not recommended in conjunction with a sanitary landfill. In the event that salvage operations are carried out, specific conditions are applied. Activities prohibited in conjunction with, or upon the site of, a sanitary landfill are listed.

66-0003
American Public Works Association. Provisions of typical refuse collection ordinances and regulations. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.409-447.

Typical provisions in municipal ordinances or regulations governing the preparation, storage, and collection of refuse are presented as a guide to officials in developing suitable local laws or in revising existing ordinances. Ordinances are not reproduced in their entirety, instead, several different clauses are given under each topic to indicate the treatment for widely different circumstances or situations. The subject matter covered by the refuse ordinances are grouped under the following headings: definitions, responsibility for the administration of refuse removal, pre-collection practices, collection practices, control of contract collection, control of private collectors, financing, and penalties for violation. The ordinances quoted have proved satisfactory in the communities named.

66-0004
American Public Works Association. Ordinance provisions for refuse disposal. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.400-424.

Typical provisions in municipal ordinances for regulating the disposal of refuse are presented in part with the aim of guiding local officials in developing a new ordinance or revising an old one. The subjects ordinarily covered by disposal provisions were grouped under the following headings: definitions, responsibility for refuse disposal, management of disposal facilities (designation of authorized sites and facilities, who may use disposal sites, responsibility of site users, salvage), control of kinds of refuse disposed of at municipal facilities (separation of refuse, hazardous refuse, dead animals), control of private disposal sites, on-site disposal, air pollution controls, financing, and penalties for violations (severability).

66-0005
American Public Works Association. Ordinance, specifications, proposal, and contract for refuse collection and disposal, Seattle, Washington, 1958 through 1962. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.425-458.

This appendix gives the full wording of the ordinance, proposal, specifications, and contract for garbage, rubbish, certain trade waste collection operations, maintenance of the various disposal sites, and the providing and placing of earth cover at the various disposal sites in the City of Seattle. The special specifications contain 61 items. Another section is devoted to the instruction of bidders.

66-0006
American Public Works Association. Rules and regulations, grants for solid waste disposal projects. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.495-503.

Full wording of the Title 42 (Public Health) of the Federal Register, Vol. 31, No. 61, of March 30, 1966, Part 59--Grants for Solid Waste Disposal Projects is included. The text covers the following items: applicability, definitions, funds available for grants, application for grants, grant limitations, grant conditions, approval of projects (Federal Financial aid, criteria), grant awards, supplemental and continuation grants, payments, other conditions, termination of grant award, termination date (final accounting), accounting for grant payments, accounting for equipment, materials or supplies, final settlement, studies and investigations (muncipal and regional), determining the desirability of study and investigation projects, studies and investigations of national value, demonstrations, determining the desirability of demonstration projects, state and interstate planning, single State agency, and coordination with planning.

66-0007
American Public Works Association. St. Louis County, Missouri, Refuse Disposal Ordinance. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.459-465.

The full wording of an Ordinance to regulate and control the disposal and dumping of garbage, refuse, and other trash in St. Louis County outside the incorporated cities is given. Provisions are included for enforcement of the ordinance and penalties for its violation.

66-0008
Avery, W. H. State concerns and responsibilities. In Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.21-22.

The remarks of the Governor of Kansas pointed out the continuing interest of the League of Kansas Municipalities in improving municipal refuse handling. Studies were made in 1946, 1950, and 1964 surveying the refuse practices in Kansas cities. Present data indicate that some enabling legislation may be needed to encourage inter-city or inter-county cooperation. Even present statutory statements regarding the increasing littering of highways and country roads may be found inadequate.

66-0009
Black, R. J. Implementing the Solid Waste Disposal Act. Presented at the Tenth Annual Technical Meeting, New England Section, Air Pollution Control Association, Hartford, Conn., Apr. 21, 1966. 7 p.

Traditionally, the solution of environmental problems has involved going beyond the confines of the populated community. Most solid-waste disposal has followed this pattern by the practice of hauling most of the refuse a minimum distance beyond the city limits and dumping it. The remainder is even more cheaply managed by burning it at the point of origin. The single new concept has been the development of the waste-food grinder and its general acceptance by the public. The ultimate dependence upon land creates a major problem because the necessary hauling distance always becomes greater as convenient disposal sites are filled, and eventually, for the larger cities, sites must be acquired in neighboring political jurisdictions. Congress has designed the Solid Waste Disposal Act to satisfy two basic purposes: to initiate and accelerate a national research and development program for new and improved methods of proper and economic solid-waste disposal; and to provide technical and financial assistance to State and local governments and interstate agencies in the planning, development, and conduct of solid-waste disposal programs. To carry out these new activities, the Solid Waste Disposal Act authorized the appropriation of more than $92 million over the four fiscal years of 1966 to 1969. In implementing the Act, the Office of Solid Wastes has already awarded 24 Research Grants and four Graduate Training Grants. Five provisions of the regulations governing the award of grants are discussed.

66-0010
Challenge of today's image. Refuse Removal Journal, 9(6):16, June 1966.

The federal grand jury investigation of racketeering and violence in the private refuse industry has tarnished the sanitation industry's name. Sanitation men must stay alert to the fact they are performing a necessary public health service, and for this reason, they should try to cultivate and promote a good public impression. First class service, clean and operable equipment, participation in community affairs, and educating the public about local solid waste handling problems are all part of this good public impression.

66-0011
Court allows state to reject low bid. Refuse Removal Journal, 9(10):34, Oct. 1966.

The New Jersey Supreme Court has ruled that the state may use discretion in the selection of most responsible bidder for the award of public contracts. The division of purchase and property of the Treasury Department may hold informal conferences if a dissatisfied bidder requests a hearing. The court added that the bidder must not be ignored or treated as a minor consideration and that each bid must be weighed carefully.

66-0012
Court holds city liable for damage. Refuse Removal Journal, 9(1):42, Jan. 1966.

The city of Hinton, West Virginia, was sued for damages to a homeowner's property resulting from negligent operation of the city dump. Testimony brought out that the municipality was aware that the dump formed a hazard due to its unsatisfactory location on too steep an incline. Cracks appeared owing to a settling process, and portions of the disposal site threatened to break off. During a heavy rain a major portion of the dump, including much debris, slid down a hillside in an avalanche and destroyed the plantiff's property. While the city contended the destruction was caused by an act of God, the court held that the rain was not unusual for the season. It therefore held the city responsible for the damage since it was negligent in the operation of the dump.

66-0013
Elements of an ordinance for refuse disposal. Public Works, 97(2):151, Feb. 1966.

The New Jersey Department of Health proposed a model ordinance covering disposal of refuse by landfill. A license is required. Applications for licenses will contain: a description of the plot of land to be used; plan of operation; water supply source; type and capacity of equipment; nuisance and vermin control; layers of fill and earth cover proposed; estimated daily or weekly volume of refuse; drainage plan. Sufficient auxiliary equipment must be available in case of a breakdown. A minimum depth of 6 in. of compacted cover of earth, ashes, cinder, or gravel must be kept on all inactive faces of the landfill at all times. Explosive and highly flammable materials and chemicals shall be excluded from the working surface area. Fences must be provided to prevent blowing of paper and to prevent unauthorized entry. Excess dust should be prevented. The Board of Health will inspect, and penalties are provided for violations.

66-0014
Fire top aide in bribery investigation. Refuse Removal Journal, 12(9):12, 19, 41, Dec. 1966.

The scandal of bribery charges rocked the New York City Sanitation Department when an investigation uncovered a promotion-for-payoffs system. First Deputy Commissioner, Vincent A. Starace, in charge of administration and selection of appointees for promotion, was fired from his

$17,500-a-year post by Mayor John V. Lindsay. A foreman, with 23 years in the Department, was suspended, and a second foreman, with 24 years service, resigned. Employees eligible for advancement were asked to pay $500 or $1,000 for higher positions. Mayor Lindsay cancelled all promotions and demanded sweeping reorganization of the 14,000-man Sanitation Department. After the resignation of Joseph F. Periconi, Samuel J. Kearing, Jr. was appointed as Sanitation Commissioner, with a specific directive to reorganize the scandal-shaken Department.

66-0015
Gilbertson, W. E. The impact of the Solid Waste Disposal Act. In Proceedings; Third National Conference on Air Pollution, Washington, Dec. 12-14, 1966. Public Health Service Publication No. 1649. Washington, U.S. Government Printing Office. p.285-290.

The most important impact of the Solid Waste Disposal Act is that it requires consideration of the fact that land, air, and water pollution problems are often indivisible. Research for new data and for innovations in waste-management technology; support for state and regional surveys of waste disposal needs; grants for education of graduate students to alleviate shortages of personnel; work on technical problems, including criteria development are all provided for in the Act. The ideal recourse in solid waste disposal is reuse or recycling, unless it can safely be deposited on the land as unusable residue. Work should be directed toward reducing waste, starting perhaps in packaging where the need is for less bulk and easier disposability. Technology to develop new methods for heat conversion of wastes into usable carbon, tars and chemical, and also methods for the economical use of solid wastes as fuel for waste water purification or to generate power should be explored. Regionalization of the approach to disposal and application of systems analysis should be more extensively used.

66-0016
Gilbertson, W. E. The implementation of the Solid Waste Disposal Act. In Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.35-40.

A progress report is presented on the implementation of the Solid Waste Disposal Act of 1965 pointing out several features of the Act which served as guidelines for the selection of proper measures, viz. the re-cycling of waste materials back into economy, the level of government at which waste management operations should be carried out, organizational and financial innovation, etc. A few specific actions are described. Further steps, especially as regards the role of the involved private enterprise, agricultural practice problems of management including personnel and environmental considerations, are indicated.

66-0017
Illinois measure aims at upgrading disposal. Refuse Removal Journal, 9(2):18, Feb. 1966.

The General Sanitation Bureau in the Department of Public Health will administrate the Illinois Refuse Disposal Act passed in 1965. Under the new statute, the Health Department is empowered to prepare and adopt minimum standards for the location, design construction, operation, and maintenance of refuse disposal sites and facilities. The department is authorized to inspect any waste facility to insure compliance with the law. Communities or persons now operating open dumps will be required to close them and cover them with earth. In addition, the final soil cover must be compacted to prevent surface water from seeping through the deposited material to pollute the ground. Sanitary landfills, incinerators, or composting plants will replace these dumps. Clarence W. Klassen, chief sanitary engineer for Illinois, stressed sanitary landfill as an answer. He suggested that small communities cooperate and engage a contractor for operation of a site. Another possibility is a county operated landfill. Incinerators appear economically feasible only for large population centers and composting is complicated because of a limited market for the finished product.

66-0018
Legislative hearing on refuse problem. Refuse Removal Journal, 9(2):40, Feb. 1966.

More than 100 northern New Jersey municipalities now dump nine million yards of solid waste annually at various landfill sites on the meadow-lands opposite New York City. Eventually these sites will be exhausted. To find an answer to this growing problem, the New Jersey legislature held a public hearing on the state's refuse collection and disposal problems. It is the opinion of many legislators that there is need for thorough study of the problem and development of a comprehensive state-wide plan for disposal.

66-0019
Michigan enacts solid waste disposal legislation. Public Works, 97(11):54, 56, Nov. 1966.

A law regulating procedures to be followed in solid waste disposal was enacted by the State of Michigan in 1965. It provides for licensing of persons, partnerships, corporations, governmental units or agencies thereof disposing of refuse. The State Department of Public Health is charged with administering the act, promulgating rules and enforcing them. Specifications for future disposal areas have to be submitted to the health department, and 13 rules pertaining to the operation of land-fills are detailed. Open dumps are not permitted unless they are isolated--at least two miles from a residence or public gathering place. Provisions are also made for control of hog feeding, central garbage grinding, and refuse burners. With respect to burners, measures to protect safety of employees must be taken and the design and operation of the facility should be in accordance with the State air pollution control act. A target date of May 31, 1968, has been set for ultimate compliance with the act by existing operations.

66-0020
Mosher, E. A. Adequate state legislation. In Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.53-60.

The legal status of solid waste disposal in Kansas and the adequacy of this legislation are discussed. The existing state legislation relating to solid waste disposal by cities is reasonably adequate. The principal, long term need in Kansas is for legislation to authorize an area approach. Various solutions to obtaining an area approach to governmental problems are listed and statutes are explained in terms of the legal aspects of solid waste collection and disposal.

66-0021
On-site waste compaction. Refuse Removal Journal, 9(6):12, 13, 38, June 1966.

The major provisions of New York City's new air pollution law as it affects refuse collection and disposal are detailed. The law: (1) requires, after two years, equipment capable of reducing refuse volume by two-thirds by means other than burning--compaction, pulping, etc.--in all new apartments over three stories, with 12 or more families; (2) permits mechanically operated food waste grinders in all dwellings or multiple-dwellings erected after two years; (3) requires existing on-site incinerators to be upgraded by installing air pollution control devices; (4) failure to meet new on-site incineration measures will mean the equipment may be sealed and the owner billed for the additional collection volume; (5) requires municipal refuse incinerators be upgraded to include the latest advances in air pollution control within three years; (6) prohibits open burning of refuse or scrap on any floating vessel that may emit contaminated air into the open air of the city; (7) suspends the license of automobile salvagers if more than two fines per year occur on his property; and (8) strengthens penalties against violators of the city's open burning law which prohibits open fires.

66-0022
Ordinance to set performance bond. Refuse Removal Journal, 9(12):14, Dec. 1966.

A proposed Madison County, Wisconsin, ordinance on refuse disposal would require landfill operators to post a $10,000 performance bond, pay a $300 a year permit fee, and pay a $10 permit fee for each truck that hauls rubbish. The bill, which applies to unincorporated areas of Madison County, would prohibit open burning and open dumping; requires operators to cover dump areas with six inches of earth; proposes grading and seeding completed fill; and requires covered, leak-proof vehicles for collections. Violators will be subject to fines of $25 to 200 for each day of continuing infraction.

66-0023
Pearson, J. B. The role of the federal government in meeting this challenge.

In Proceedings; Solid Wastes Symposium, Lawrence Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.15-18.

The new Federal Program, recognizing the need for assistance from state and national governments to the local communities, as previewed by the Solid Waste Disposal Act of 1965, is discussed. This program creates a greater opportunity for local communities, acting on their own initiative, to solve their problems of solid waste disposal. It also covers the role of the institutions of higher learning, providing for research and demonstration grants to academic institutions and other appropriate public agencies relating to the matter of the disposal of solid wastes and agriculture wastes in particular. (The Office of Senator Pearson prepared a Fact Sheet on the Federal Solid Wastes Program which was distributed. This Fact Sheet is included in the Proceedings.)

66-0024

Photos aid drive on overflow cans. Refuse Removal Journal, 9(11):42, Nov. 1966.

In St. Louis, the Sanitation Department takes pictures of illegal trash accumulations to show to the responsible resident. A warning is then issued, and seven days later a police court summons is issued if nothing is done. The photographs are used as evidence. In one district alone, 284 violations were thus recorded, and later 41 persons were fined $100 each for not heeding the warning. The virtue of the camera technique is psychological, since the householder knows the photo will be available for courtroom use.

66-0025

Stead, F. M. Future air quality standards and refuse disposal operation restrictions. In Proceedings; Third National Conference on Air Pollution, Washington, Dec. 12-14, 1966. Public Health Service Publication No. 1649. Washington, U.S. Government Printing Office. p.275-280.

The close relationship between liquid wastes and water resources is realized. One cannot be managed intelligently independent of the other. The same principles apply to air. Air pollution controls cannot proceed without knowledge of the real environmental system that is being dealt with. The attention is on input, with no real knowledge of the size or method of operation, or the recycling of the system. Deprivation of the full benefits of the air resource includes: the point at which the air becomes literally unbreathable, the point of opacity at which visibility is curtailed such that all transportation must come to a halt, and the point which, while not lethal, it directly affects the welfare of human beings. The new Federal Water Pollution, Air Pollution and Solid Waste Acts have all in effect demanded that the waste disposal activities of the nation be upgraded to at least the no-nuisance level. If comfort is the highest air pollution control objective, refuse disposal need not impose a restriction on air pollution control programs since it is now a matter of adhering to the standards. However, if esthetics play a part in the air pollution objective, nothing less than sparkling clean air can be accepted.

FINANCES (including Costs, Fees, Taxes, etc.)

66-0026

American Public Works Association. Committee on Solid Wastes. Factors affecting refuse collection cost. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.78-101.

Cities differ in providing refuse collection service and these differences influence the cost of conducting the work. Interpretation of refuse collection cost data is difficult when the per capita cost per yr varies from $0.24 to $7.40 for 38 cities (1960). Collection operating costs (dollars per ton) are tabulated for 11 selected cities for 1965. Some of the fundamental factors that must be considered in order to get an accurate comparison among communities are: climate and geographical differences, form in which refuse is presented for collection, frequency of collection, place from which refuse is collected, length of haul, number of classes of refuse collected, wage rates of collectors and drivers, population density, and accounting and field reporting practices. Normally the expense for labor is from 60 to 80 percent of the total cost of refuse collection. Cities responding to the 1964 APWA survey on the prohibition of garbage grinders are listed. A sensible compromise may be to adjust cost figures for important differences, and, by way of qualification, to call attention to differences that have not been taken into account.

66-0027
Application needed for apartment calls. Refuse Removal Journal, 9(2):39, Feb. 1966.

Under a new refuse service policy adopted by the American Fork, Utah city council to go into effect in 1966, the owner of a multi-unit building must make application for service and agree to pay the cost of it. In the event that a tenant, who is not the owner, is billed for water and sewer service, refuse collection fees also may be billed, provided the owner will assume final responsibility for payment as he does with water and sewer service.

66-0028
American Public Works Association. Committee on Solid Wastes. Financing refuse collection operation. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.268-295.

The advantages and disadvantages of various fund sources (general property taxes, separate property taxes, separate charges or fees, can and container rental charges, special assessments, miscellaneous revenues) are compared. Data indicate a trend toward more use of the service charge method of financing from 1955-1964. Approximately one-half of the cities reporting in the 1964 survey finance their refuse collection service with funds from general taxation alone. Financing collections through service charges, and general tax, plus service charge arrangements, is found in 47.6% of the communities removing refuse by contract. Data are given for service charges for residential and commercial establishments. It is concluded that it is better to provide the removal service at general public expense in those communities which are able and willing to appropriate enough to make possible complete collection from all properties.

66-0029
American Public Works Association. Committee on Solid Wastes. Reporting, cost accounting, and budgeting. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.360-380.

Complete information on operations must be regularly and accurately secured and periodically summarized and analyzed. Simple field reports and summaries have been shown to be the most satisfactory. Measurements of performance are now rather widely used as indices of accomplishment and efficiency, whereas formerly almost sole dependence was placed on unit cost. The purpose of cost accounting as applied to refuse collection is to assemble the various expenditures by class of refuse, district, crew, route, or kind of work so that production efficiency and effort can be measured and evaluated. Electronic data processing, for example, can be used for data on tonnage hauled, miles traveled to disposal site, identification of the site, and number of loads hauled.

66-0030
Argentine workers upset wage plan. Refuse Removal Journal, 9(4):49, Apr. 1966.

Plans by the government of Argentina to halt the country's runaway inflation, by imposing a 15 percent ceiling on wages, were thwarted by a strike of refuse collectors in Buenos Aires. The government was forced to pay refuse collectors a 43 percent increase after they had been on strike for 5 days. During that time 12,000 tons of refuse had piled up in the city streets and the health of the 3.6 million citizens of the capital was threatened. The city plans to cover the large wage increase by doubling the refuse collection fee paid annually by the householders. The government's failure to hold its own employees to an anti-inflationary wage line has doomed any prospect to persuading workers in private industry and other municipal employees to cooperate in the interest of national stability. The inflationary spiral is estimated between 25 and 40 percent annually.

66-0031
Cite lower costs of joint authority. Refuse Removal Journal, 9(12):45, Dec. 1966.

Four New Jersey towns with a total population of 325,000 have agreed to a joint refuse disposal authority. The Quad-City Solid Waste Disposal Committee, which began the study with the help of a $50,000 grant from the Office of Solid Wastes, has reported the joint system would be economical and far more efficient than the present methods of refuse disposal. Average cost of the system, using incineration or another method, would be $7.39, leading to a $1.74 increase for Clifton and one cent increase for Paterson. Wayne would realize savings over the present cost of $9.04 per ton, as would Passaic, presently paying $8.76 per ton. The long-term advantage would be stable costs in the face of a steadily rising volume of refuse. In Paterson, Clifton, and Wayne, the volume of refuse increased 5 to 7 percent during the last 6 years, and in Passaic, the increase was 19 percent. Most refuse is presently dumped in landfill located in the Hackensack River meadowlands, but this area is likely to be developed for industrial purposes within the coming years. One large disposal unit, costing about $5 million, adequate for at least 20 years, is planned.

66-0032
Counting the cost. Public Cleansing, 56(7):322-323, July 1966.

The annual costing report for refuse collection and disposal and street cleansing for 1963 to 64, published by the Ministry of Housing and Local Government, is discussed. Not all of the reporting authorities weigh the refuse collected. It is pointed out that costs should not be the primary consideration, but rather, the effectiveness of the public health services. Little purpose is served in proving that a comprehensive paper sack system or fully dustless loading method costs more than an irregular curbside collection from battered oil drums and boxes. Cost comparisons of the two principal methods of disposal, controlled tipping (15s. 1d.) and mechanical disposal (24s. 7d.), show that mechanical disposal is considerably more expensive than controlled tipping, but the term 'controlled tipping' is subject to interpretation.

66-0033
Deininger, R. A. The economics of regional pollution control systems. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.815-833.

The two problems covered in this investigation are: how the treatment of various plants should be established to minimize the total costs of waste treatment over an entire region or basin and how wastes are transferred between communities. A mathematical model was formulated and the results obtained point out large potential savings for regional systems. No consideration was given to the question of what water quality should be maintained and the necessary institutional arrangements to implement such a system were ignored. The influence of various parameters such as river flow and temperature are covered. Diagrams for inter-community sewer and treatment systems are illustrated.

66-0034
Funds contractors cut town collection cost. Refuse Removal Journal, 9(10): 48, Oct. 1966.

According to a report by the Planning Board of Monmouth County, New Jersey, municipalities can cut refuse handling costs by authorizing private contractors to collect and dispose of wastes. In 15 communities in the county which collect their own refuse, average annual cost is $8.33 per person. Where contractors are used, average cost per person is $5.84. The report also suggests that the county's municipalities join and form four regional groups to combat future refuse problems. While the county now uses 14 landfill sites and two incinerators, an estimated 75 percent rise in population will mean that 626 acres of landfill will be needed by 1985.

66-0035
Give tax break on disposal equipment. Refuse Removal Journal, 9(12):54, Dec. 1966.

According to testimony by the Institute of Scrap Iron and Steel before the Senate Finance Committee, solid waste disposal equipment should receive the same exemption from the investment credit suspension as that proposed for anti-air and anti-water pollution devices.

66-0036
Keep your eye on costs. Refuse Removal Journal, 9(7):16, July 1966.

The economics of selling waste disposal services is discussed. Contractors who operate their disposal service as if they were selling consumer products at a discount are liable to suffer when operating costs increase, taxes go up, employees get raises, newer equipment is bought, and maintenance needed. As disposal and operating costs rise, both contractors and municipal officials find their budgets squeezed. In such a situation, prices must be adjusted and taxes raised, since the efficiency of a refuse fleet deteriorates quickly when corners are cut. As an alternative, rate-cutting is risky. For example, when Denver closed its municipal landfill to private contractors, it was the cut rate operators who suffered the most.

66-0037
May impose fees on private autos using transfer station. Refuse Removal Journal, 9(4):49, Apr. 1966.

The Sanitation Department for King County, Washington is losing about $400,000 a year on over-all refuse disposal operations and has suggested the imposition of fees on private autos, trailers, and pickup trucks using the facilities. Private vehicle owners have not been charged for disposing of refuse since 1948. Thus, the Department has proposed to buy 8 cash registers, hire 15 to 16 cashiers, and charge $.50 for automobiles and $.75 for cars with trailers or pickup trucks. Industrial hauling rates will be based on weight instead of yardage, for about $3 a ton at the transfer stations and $1.25 a ton if hauled to the disposal site. The editor notes that the new rate system, with new salaries and overhead amounting to about $70,000 will have to collect $200 a day just to pay for the administration of the plan.

66-0038
Rates periodically adjusted to meet expenses. American City, 81(11):26, Nov. 1966.

San Bernadino, California, uses a fee system that eliminates the inequities of a blanket tax. Residents receive bills bi-monthly. Rates are based on four categories of service: restaurants and grocer garbage, commercial enterprises, single-residence pick-ups, and multiple-dwelling collection. Residents receive service twice-a-week. The city owns and operates six front-loading Dempster-Dumpmaster units.

66-0039
Receive higher bids for new contracts. Refuse Removal Journal, 9(1):28, Jan. 1966.

Municipalities in New Jersey are receiving higher bids when their refuse collection contracts come up for renewal. The lowest bid received by Elizabeth, N.J., population 110,000, for the next five years of refuse collection was $2,655,000. This figure is $365,000 higher than for the previous five-year period. Belleville, N.J., population 35,000, awarded a new five-year $1,195,000 refuse disposal contract. The New Jersey township of Springfield, population 14,000, after twice rejecting previous bids, awarded a five-year $593,000 municipal refuse disposal contract. The new pact, which includes $40,000 for monthly cleanups, represents a $41,666 annual increase over the current contract of $85,000 a year. Included in the new measure is a provision that the company limit charges for increased service to $4,150 per 100 additional units per year.

STORAGE (including Methods and Equipment)

66-0040
Agardy, F. J., and M. L. Kiado. Effects of refrigerated storage on the characteristics of waste. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.226-233.

The objectives of this study were: (1) to determine the effect of 'refrigerated storage' on standard analyses carried out on wastes; (2) to determine the effect of 'frozen storage' on standard analyses carried out on wastes; and (3) to determine the effect of 'length of storage' under each of these conditions on standard analyses carried out on wastes. All analyses were performed using raw sewage collected from a sewage treatment plant. The results indicate that neither procedure is singly satisfactory as a method for preserving waste samples. A recommended storage procedure is summarized.

66-0041
The age of alloys and plastics. Public Cleaning, 56(6):283-291, June 1966.

The introduction of a new material into commerce almost inevitably finds an extension into everyday use in one or more of the operations of a Cleansing Department. An example of the use of aluminum alloys in the Cleansing service is the panelling of vehicles used for refuse collection.

Aluminum bodies are used on electrically-driven street orderly trucks, where lightness means extended mileage and longer battery life. The use of aluminum cladding for industrial buildings already has been applied to new refuse disposal plants. Here the resistance to weathering, lightness, ease of handling, modern appearance, and comparative cheapness of this material recommends it highly. Although early plastic dustbins (trash cans) were deficient in many respects, recently introduced plastic units of high density polythene appear to be much more satisfactory. Two new styles of dustbins are described in detail. Both have a life expectancy of ten to fifteen years. The following is a list of plastics which have application in public cleansing work: polythene, vinyls, nylon, P.V.C., urea-formaldehyde, polyvinyl butyral, polypropylene, expoxy resin, neoprene, perspex, and polyester.

66-0042
And the sacks are returned through the letterbox. Public Cleansing, 56(4)151: Apr. 1966.

Mont-sur-Marchienne, being a member of the Intercommunale, was free of responsibility for collection and disposal of refuse. Since this area has many steep hills which hinder the use of lorries and result in haphazard collection, the use of paper sacks was initiated. These were later changed from opaque to transparent sacks. When the employee collects the full sacks he leaves a new carefully folded sack in the mailbox. One man can collect in a diesel-engined lorry which results in a cut in cost.

66-0043
Burrows, J. H. Refuse storage from the public health point of view. Public Cleansing, 56(1): 27-30, Jan. 1966.

Factors such as noise abatement, labor shortages, and the changing nature of domestic refuse have caused a need for reevaluation of refuse containers for storage. From the point of view of noise and weight reduction, the paper sack would appear to be a perfect container, but disadvantages include possible perforation of the bag and possible spillage. Heavier type plastic dustbins of 2½ to 3½ cu ft capacity, with a weight of some 10 lb have the advantages of being light, strong, and durable and they can be purchased for a little below the price of the standard metal bins. In addition, they are almost noiseless in use. The Local Authority district should implement a 'bin provision' as a rate-borne charge, and bulk buying on annual tender would provide containers at an economical price. There is a need for bulk containers of about 1¼ to 1½ cu yd to provide accommodation for a weekly service of refuse for some 12 to 16 apartments with a twice weekly collection rate. They should be housed in a well-ventilated compartment and under frequent supervision so as to minimize spillage and chute chokeage. To facilitate servicing and removal of the containers, a fleet vehicle provided with bulk container lifting apparatus could be provided. In apartments it would be advantageous to provide small bucket containers with lids for daily use within each apartment. Refuse chute entrance points should be in open areas and not in an enclosed corridor, where upward air pressures can create dust dispersion and offensive smells within the building. Hospitals, schools, and clinics provide a special problem for the refuse storage service. With this particular type of waste, the use of paper sacks with final storage in bulk containers is necessary.

66-0044
Contractor uses 3,500 containers. Refuse Removal Journal, 9(7):6, 8, 22, July 1966.

The activities of the Granada-Sanchez Disposal Company, which operates in the San Fernando Valley north of Los Angeles, are described. The operation is almost wholly containerized, with over 3,500 units placed at large and small industrial plants, commercial establishments and colleges. Granada-Sanchez was formed as a result of a merger of three smaller refuse firms. Savings were immediately effected by this merger; the company's income rose from $28,000 to $50,000 per month. A boost during this expansion was the introduction of large transfer containers of 25, 30, and 50 cu yd. These are hauled by three I-H cab-over tandems, and are placed wherever the volume warrants one. As an example, the operations at Litton Industries, General Motors, and the University of Southern California are described. In places where maneuvering space is limited and there is no room for a container, refuse is collected in paper sacks and dumped by hand. To maintain these thousands of refuse containers, the company uses a special lift gate truck to deliver refurbished or new containers and bring those needing work back to the company's yard for repair.

Excellent maintenance and progressive employee incentive programs have also added to the company's progress. Disposal is accomplished at three landfill sites.

66-0045
Copolymer plastic refuse-can liners. American City, 81(6)100-101, June 1966.

The results of an experiment in which 800 Lebanon, Ohio, families agree to use plastic garbage liners for a period of four weeks are reported. Each resident received three plastic liners and wire-twist ties per week. Instructions told them how to place the liners in the cans, how to gather them at the top for binding, and to remove the secured liners from the cans and carry them to the street on collection day. The liners reduced collection time by 20 percent. Sanitation men often could throw several bags at a time into the packer truck, and they wasted no time handling the heavy metal containers, returning them to the curb, or retrieving spilled trash. No liners were reported broken by rough handling and they proved remarkably resistant to the ravages of the canine community. The homemaker was pleased with the liners, since they made a neat, clean appearance on the street, kept the cans clean, and eliminated spilled garbage. The city is considering the collection of the plastic-bagged trash and garbage in open dump trucks, since the refuse is not loose to blow about. The city is now offering these plastic bags to householders on a voluntary basis at a price of eight for $0.50.

66-0046
Disposable plastic bags. Modern Sanitation and Building Maintenance, 18(6):40-41, June 1966.

Waste Minders have plastic bags treated with bacteriostat to prevent bacteria growth, help control staph, and reduce the danger of cross-infection. They are available in 13 sizes to fit standard waste receptacles with capacities ranging from one to 60 gal.

66-0047
Homeowners favor paper refuse containers. American City, 81(6):97, June 1966.

The result of a survey, conducted by Paperbag Refuse Systems, Inc., to determine the public's response to the paper bag refuse collection system, is reported. One hundred homeowners were interviewed in each of 12 cities located in New York, Connecticut, and Massachusetts. All of the cities have populations in excess of 50,000 and, all but one, operate complete or partial refuse collection service. Personal interviews were conducted on as wide a geographical basis in town as possible. The interview materials consisted of a printed folder describing the system and an interview form. The response form listed three possible answers: yes, no, and undecided. Undecided responses were not counted in calculating the ratios. The ratio of favorable to unfavorable responses varied from 6-1 to 17-1, even after the homeowner was told that the cost of the program would be added to his taxes or assessments. Based on studies conducted over the past four years, Paperbag Refuse Systems, Inc. calculated that 85 percent of the families would need one holder and 100 bags per year, and 15 percent would need two holders and 200 bags per yr.

66-0048
Islington goes dustless. Public Cleansing, 56(10):516, Oct. 1966.

After a 17-month trial it has been decided to extend a dustless system of refuse collection to all of the London Borough of Islington. The system will consist of 16,400 all-plastic 3½ cu ft dustless bins at a cost of $57,195, one dustless vehicle, a secondary vehicle (a barrier loader for the time being) and, at the same time wastepaper salvage. Bins will be supplied to residents at a direct rate charge.

66-0049
It could be better. Public Cleansing, 56(5):223-225, May 1966.

Although the disposable (paper) sack system is more satisfactory than the traditional bin system, there are some disadvantages. The well-filled sack, once removed from its holder may leave the refuse exposed, leading to some spillage while being carried and to dissemination of dust when tossed into the hopper of the vehicle. There is also resentment on the part of the long-service dustman toward new techniques and equipment. Paper sacks need to be 'sold' to the public as well as to the cleansing officer. The use of plastic for disposal sacks does not seem to attract the same attention as paper so far. Some experiments have been carried out but, at present prices, a plastic sack costing the same as a paper one is so thin that it is easily pierced. Once the plastic is punctured it almost immediately splits from top to bottom. When using paper sacks it is necessary to use rear-loading and mechanical packing vehicles rather than side-loaders or platform lorries. It is suggested that decisions for improved service be made now, so that they can be immediately effected when financial conditions warrant them.

66-0050
Malchereck, W. Experiences with plastic trash cans. Staedtehygiene, 17(2):40-42, Feb. 1966.

The new plastic trash cans are made of a special mixture of low pressure polyethylene which is very resistant to oxidation and ultraviolet radiation. They are light-weight (a 35-liter plastic can weighs 2.2 kg as against the 8.3 kg of the 35-liter tinned sheet steel can, or 6 kg vs. 25 kg for the 110-liter cans). Their smooth surfaces cannot be attacked by acids and bases and they cause no noise when being handled. The only drawback is their easy flammability. At temperatures above 130 C polyethylene becomes soft and at 320 C it starts to burn. This was the major reason for rejecting them up to now. But recently the city of Hamburg introduced them in one of its districts. They advised each household of the flammability. The success was great. From 600 trash cans less than 30 have been destroyed by hot waste. In the cold winter of 1962-63, however, some trash cans cracked. The material used at that time became brittle in the cold. But a more elastic material has been developed and the city decided to substitute 35-liter plastic cans in the place of tinned sheet steel cans. Approximately 12,000 plastic cans are now in use, all carrying a label warning not to dump hot ash into them. The 110-liter cans, introduced in 1964, also found immediate approval of the users. Like the sheet cans, the plastic cans have a reinforced upper rim and bottom of 4 mm thickness. The sides are 3.3 mm thick. Plastic joints link the lid with the body. Discarded plastic trash cans can be either reused in the chemical industry, burned or crushed and dumped. (Text-German)

66-0051
The modern office building: waste disposal poses diverse problems. Modern Sanitation and Building Maintenance, 18(2):14-15, Feb. 1966.

Burlap bags for the trash removal have been replaced by heavy duty 40 by 55 in. plastic bags in Bankers Trust Company in New York. The contents do not seep through and vermin cannot escape. A bag holds 30 to 50 lb of waste paper. A machine chops the cafeteria garbage into the consistency of sausage meat, thereby reducing volume by 80 percent.

66-0052
More turn to sacks. Public Cleansing, 56(8):425, Aug. 1966.

Western Europe used 110 million refuse sacks last year. This compares with 24 million in 1962 and 100,000 in 1955. Britain used 43 million. (Manchester was the largest city using them.) Sweden used 28 million, Denmark 18 million. The metal waste container is gradually disappearing.

66-0053
New materials. Public Cleansing, 56(6): 259-261, June 1966.

The advantages of using polythene sacks for refuse collection and storage appear at first sight to be overwhelming. These include reduced manpower, less weight to carry, no spillage of refuse between houses and vehicles, noise elimination, and use of a simpler and less expensive type of vehicle. In controlled tipping all organic material eventually breaks down due to the presence of air, moisture, and heat; the bacteriological action changes the organic material into simpler substances, and the temperature rise in the tip is due entirely to the working action and multiplication of such bacteria. However, in a hermetically sealed polythene bag the temperature very seldom rises above 75 F. The amount of air inside the sack may be insufficient for the bacteria to develop and multiply. Wet-strength paper sacks are deficient to this extent also. If polythene bags are used for refuse storage the position will be far worse than with the use of paper sacks. Polythene will not burn, it will only shrivel and solidify on the bars of the destructor fire. In a tip observation suggests that its life is indefinite. After 10 years the polythene appears to be no different from the day it was placed in the tip. The sealed polythene bag is only the beginning of the waste disposal problem. Either the manufacturers or the Central Government should provide the necessary research into the ultimate disposal of polythene containers.

66-0054

New refuse compression system at Wandsworth flats. Public Cleansing, 56(10):496-497, Oct. 1966.

The Deva system consists of pneumatic equipment which automatically controls the filling and compression of refuse in paper sacks. Before the installation of the Deva unit, 15 bulk containers, each 1¼ cu yd capacity, were collected weekly. The weekly volume of refuse totaled about 500 cu ft. There are about 300 residents in the 22-story apartment house. The cycle mechanism is simple: when a parcel of refuse is dropped down the chute, the cycle is set in motion by a trip valve at the head of the machine. A heavy restrictor plate moves laterally, thus blocking the base of the chute, while the first parcel of rubbish is being compressed. This sequence is repeated until the sack is full, at which time the 10-sack carousel rotates one place placing the next empty sack in position to receive more refuse. When 9 sacks are full, they are removed, stapled, and stacked, ready for collection. Volume comparison between the bulk containers and the Deva system is supplied.

66-0055

No-return plastic waste bag. VDI (Verein Deutscher Ingenieue) Zeitschrift, 108(16): 721, June 1966.

This new hygienic method of collecting trash consists of 48 plastic waste sacks on a roll on a metal fixture which can be equipped with wheels. As soon as one sack is filled it is torn off the roll and disposed of. The sacks come in sizes of 10, 15, and 30 ~~liter. (Text~~-German).

66-0056

Now-sacks on wheels. Public Cleansing, 56(4):162, Apr. 1966.

The City and Royal Burgh of Dunfermline has converted two of their street cleaning vehicles to enable these units to carry paper sacks instead of metal containers. This 'Binsac' paper sack refuse collection system is efficient and recruits labor. The converted units are time saving, labor saving, hygienic, low cost, and simply and quickly converted.

66-0057

Ohio Department of Health. Refuse storage. In Refuse sanitation. Columbus, 1966. p.4-8.

Proper premise storage of refuse contributes materially to speeding up collection services, thus making the job easier and collection costs lower. All garbage and refuse can be stored ideally in a galvanized corrugated metal container. Two 30-gal containers are usually sufficient for the average household having weekly collection service. Refuse boxes are highly unsatisfactory, as they make loading difficult and are hard to keep clean. Refuse container houses or rooms, as used by larger establishments, can be very satisfactory if kept rat- and fly-proof and if they have adequate lighting and ventilation. When underground vaults are used, ground and surface water may present problems. Large bulk-type containers are often used by large establishments, but require special trucks for pickup. Garbage and refuse containers should be located in a dry, clean place. Platforms or racks permit easy cleaning of containers and present a neat appearance. Containers should be washed often and can be sprayed to aid fly control. Household garbage should be drained and then wrapped in several thicknesses of paper before being placed in containers for storage.

66-0058

Pack refuse into paper sacks with automatic units. Refuse Removal Journal, 9(7):18, 33, July 1966.

A new method of packaging refuse under pressure into paper sacks, the DEVA Refuse Compression System, is described. This technique is especially suited for on-site refuse handling in such places as apartment buildings, schools, supermarkets, and institutions. Materials of almost any type, such as cans, glass, and plastic bottles, food wastes, and paper, enter the system from a chute. The machines then automatically compress and pack the material into disposable paper sacks. For buildings having no refuse chutes, there are models designed for depositing the waste directly into the paper sack whose contents are then compressed. Various types of automatic units offer both high and low compaction, including a carousel arrangement. The operation of the high pressure unit, which compresses at 2,850 lb and uses 3.5 cu ft sacks, and of the low compaction model which uses 6 cu yd sacks and 700 lbs of pressure, are described in detail. Semiautomatic machines are available in two types also:

a compact two sack shuttle unit which needs only 9 sq ft of floor space, and a 4 to 12 sack reciprocating unit for larger installations. Both are fed manually. The machines may be installed in almost any location; only a small diameter pipe or hose is required for connection to an air compressor.

66-0059
Paper sack system passes the test. Public Cleansing, 56(1):35-36, Jan. 1966.

An experiment was made to determine the efficacy of using paper sacks and holders as a replacement for dust binds. The areas involved were Lanchester village and the villages of Castleside and Satley in County Durham; schools, factories, and hospitals were excluded. Davidsons holders with Ibeco water-proof packs were selected based on a preliminary test. The system has been functioning satisfactorily for the past sixteen months with the exception of a few isolated minor incidents. There were a few instances of accidental firing of the sack by inadvertently placing hot ashes in it. There were very few cases of gross misuse of the paper sack, such as damage caused to the sack by sharp edges of unwrapped broken glass. In severe weather there was some damage caused by small birds in search of food. The sacks stood up well even during heavy falls of snow and rain due to their toughness and resistance to moisture and the fact that the Davidson holders provide maximum protection. In large houses it was found necessary to increase storage by an additional sackholder and paper sack. The introduction of the first stage of the paper sack system has obviated the employment of additional labor for dustbin collection which would have become necessary due to the expansion of building on new housing sites.

66-0060
Paper sacks in Florence. Public Cleansing, 56(11):573, Nov. 1966.

Florence, Italy, is using 25-liter capacity sacks for individual families and 60-liter capacity sacks for 4 to 5 families. About 70,000 households now place their rubbish in these sacks, and an additional 20,000 will shortly. About 15 million sacks will be used annually, a level near Denmark's consumption. Milan is now testing this method and Bologna will soon.

66-0061
Plastic bags get wider use in Toronto. Refuse Removal Journal, 9(10):6, 48, Oct. 1966.

With the sanitation by-laws amended to permit their use as waste containers, the city of Toronto has begun the experimental use of polyethylene refuse sacks in its residential and limited commercial collection service. In tests in 1965, about 140,000 bags were distributed to about 10,000 locations. Under the present plan, only private homes or apartment units will be provided with bags at no charge; the initial supply of $50,000 worth of bags will be sufficient until March 1967, when a full year's budget presentation will be made. Between now and March 1967, Toronto may become more specific about the status of polyethylene refuse sacks, and will consider whether their use become mandatory, permissive, by municipal distribution, consumer purchase, or even rejected. Disposal of the sacks is no problem, for polyethylene has been found to break down into carbon dioxide and water vapor under high temperatures. Advantages of using the sacks include labor and cost savings of 20 percent neatness; cleanliness, and quieter pickup. The cost of the sacks, if supplied to all residential households at the rate of two a week, would be about $750,000 annually. Thus, using poly bags for all residential collection in Toronto would increase present expenses about $110,000, but the commissioner estimates that only 480 sanitation men would be needed instead of the 600 presently used. Other Canadian cities have considered using the poly bags. In a survey, residents of Toronto (88%) indicated they would continue to use the bags if the city provided them and 32 percent would continue if they had to purchase them themselves.

66-0062
Polyethylene dustbins. Surveyor and Municipal Engineer, 127(3848):39-40, Mar. 5, 1966.

A new dustbin made of Shell high-density polyethylene for household refuse is announced by the manufacturer, Harcostar Ltd. The functionally-designed bin which is illustrated is intended primarily for outdoor use and is strong and pliable. The one-piece solid construction is both crack- and split-proof and has rubber-molded lid. It weighs 12 lb. The lid, which is easily removable, will stay in place under adverse conditions. The side handles on the bins have proved to be capable of taking the roughest treatment. Twin hand grips are molded into the bin base to help in lifting. Local authorities consider that the bins have something to offer because of their noiseless construction, and a design which makes them easy to use, empty, clean, and sterile.

66-0063
Refuse sacks add sock to kraft sales. Chemical 26, 2(11):28-34, Nov. 1966.

The manufacture of paper refuse sacks for use in the U.S. is discussed in terms of sales and chemical needs. Sacks are processed with various types of wet strength resins, lightweight polyethylene coatings for grease resistance, and wax blends for water repellency. These have to be supplied by chemical companies. Speculation is made as to which companies will want to become suppliers. Several quotes of approval and disapproval of the idea of using paper sack disposal at all are stated. The difficulty of dealing with the municipal market hampered by politics and homeowners is mentioned. The involvement of International Paper, Union Camp and St. Regis is explained in more detail especially in connection with polyethylene vs. wax coatings.

66-0064
Rhode Island town gets a U.S. grant to test use of paper refuse bags. Paper Age, 2(2):11, Oct. 24, 1966.

Barrington, Rhode Island, received the first federal grant to investigate the disposable paper refuse sack as a means of collecting and easily disposing of garbage and other solid wastes. The refuse sack system will be adopted in three stages: 1/3 of the town (1500 homes) in 1966, 1/3 in 1967, and 1/3 in 1968-69. Progress reports will be sent to state and federal governments. The public Health Service granted $20,552 for first year test to cover personnel, equipment rental, and supplies expenditures. This represents 2/3 of the amount required. St. Regis Paper furnishes all refuse sacks and holders. Eventually, Barrington anticipates completely financing and adopting the system itself. Program objectives are: to demonstrate the feasibility of the refuse sack as a year-round system in New England; to show garbage and rubbish can be collected together and employed in sanitary landfill; to determine landfill capabilities; and to discover economics of the system. Metal bag holders are guarded against animal depredations. The two-ply bags chemically resist grease and moisture. Barrington requires a new method of disposal; the former method of hog feeding is being reduced significantly due to diminishing hog raising. Incineration, though advantageous, is too costly for the town.

COLLECTION AND DISPOSAL–General

66-0065
Billings, C. H. Refuse collection and disposal. In the 1966 sewerage manual and catalog file. Ridgewood, N.J., Public Works Journal Corporation, 1966. p.264-271.

The vehicles used in refuse collection should be sanitary, easy to load and unload, and safe for workmen. Other factors to be considered are loading heights, covers, unloading heights, covers, unloading devices, motive power, speed of travel, and water tightness. Bulk refuse collection can utilize detachable receptacles placed at convenient points. Refuse systems are available which utilize paper bags instead of metal cans. Usually garbage, combustible rubbish, and industrial refuse, and dead animals are incinerated. Sanitary landfill is a method of disposing of garbage mixed with other refuse by filling and immediate covering. Other disposal methods include hog feeding, grinding, and disposal with sewage and composting. Attention should be given to air and water pollution standards and to odor control in all disposal operations. Various types of equipment are discussed and illustrated for each technique.

66-0066
City of Manchester. Cleansing Department. Annual report for the year ending 31st March, 1966. Manchester, 1966. 37 p.

The activities of the Cleansing Department include: collection and disposal of refuse from dwelling-houses, shops, and other premises; cleansing and removal of refuse from food markets; recovery and sales of materials salvaged from refuse; a service for the disposal of unwanted motor vehicles; clearance of dumped refuse from neglected sites; free collection of bulky house refuse; and the supply and renewal of dustbins and paper sack equipment for the storage of domestic refuse. Statistics show 241,620 tons of refuse collected for the year. New electric refuse collection vehicles were tried experimentally. A complete financial statement shows an increase in net operational expenditure on refuse collection and disposal largely because of pay awards, heavier transport costs, and debt charges. A statistical section of the report contains population information, tonnage of refuse collected and disposed of, and personnel information.

66-0067

Conference exhibition 1966. Public Health Inspector, 75(2):48-50, 52-54, Nov. 1966.

A municipal exhibition was held in conjunction with Scarborough Conference. On display were weatherproof clothing, airline breathing apparatus, odor control sprays, bactericidal detergent, paper and plastic sack units, insecticides, and sanitary towels and bandages. Among the refuse disposal display were composting plants, sorters, pulverizers, chutes, mobile sanitary units, refuse handling vehicles, and earth-moving equipment.

66-0068

County refuse collection data. Public Works, 97(2):60, 62, Feb. 1966.

Salt Lake City County conducted a study to project future needs. Its budget for 1965 was $540,018. The Department operates 22 packer trucks, but due to age and constant operation, breakdowns leave an operational fleet of 18 to 19 per day. Three residential dumps, of which two are open 7 days a week, 24 hr a day are operated. The monthly cost of these three dumps amounts to $1,696.41. Disposal is by cut and fill; a trench 3,000 ft long, 60 ft wide and 6 ft deep is dug. The cost of opening such trench amounts to $6,643.20. It is dug in 60 working days and serves an average of 9 months. Average distance per truck per day is 78.6 miles; average gas consumption is 23.2 gal; average refuse collected per truck per day is 20,000 lb. The Salt Lake County Department of Sanitation services 208,720 persons living in 50,243 dwelling units. Refuse collected per capital per day was 1.38 lb; man hr per ton collected averaged 2.28.

66-0069

Emphasize survey accuracy. Refuse Removal Journal, 9(12):22, Dec. 1966.

In the year since the Solid Waste Disposal Act was passed, data has been collecting at the Office of Solid Wastes, for the first problem is to accurately define and measure the scope of the nation's solid waste problem. Whereas previous studies, for example by A.P.W.A.'s Research Foundation and Aerojet-General Corporation for the state of California, have been inaccurate and stopped far short of presenting a true picture of collection and disposal in the United States, it is hoped that, with such solid financial backing, the current studies will consider all generating sources, all collection factors, and all disposal channels. Studies must include municipalities and their residential collection and disposal problems, and also describe the contractor's role in all fields.

66-0070

Exec councils of INTAPUC and solid wastes institute meet. [American Public Works Association] 33(10), Oct. 1966.

The principal speaker was Reikichi Kojima, Director, Tokyo Institute for Municipal Research, who spoke of refuse practices in Japan. Wastes, particularly night soil, were used as fertilizer before World War II. Garbage was fed to pigs. Waste paper, empty cans, scrap iron, and glass were recycled and utilized. Most houses were equipped with baths which used wooden pieces and other trash for fuel. Now, however, farmers use chemical fertilizers and artificial feed in place of night soil and garbage. It is not profitable to collect wastes for reuse due to a rise in living costs and consequent increase in wages of workers. Other persons commented on the situation in the following countries: France, Switzerland, Brazil, Netherlands, Venezuela, Scotland, Canada, Great Britain, and Sweden.

66-0071
The how, why, and wherefor of cleansing in New York. Public Cleansing, 56(4): 173-175, April 1966.

The New York Department of Sanitation is responsible for refuse collection at domestic premises with separate collections for industries. At the larger multi-story buildings, a 'building custodian' is responsible for the incineration of refuse. The Department, therefore, has to remove only 10 to 15 percent of the original bulk. Each of New York's eight boroughs is divided and subdivided according to population, traffic, topography, etc. The 1,000 member crew services the 4,000 pieces of equipment, 1,600 of which are collection vehicles. The 1,000 ton-a-day plants work round-the-clock, with 35 men employed on the 8 am to 4 pm shift and 15 on each of the other two shifts. Most 1,000 ton-a-day plants have an average throughput of 900 tons. The New York plant, on a 6-day week, has a loss of 3 to 5 percent due to heat losses within the furnaces. New York estimates the mechanical costs of any proposed installation at about 36 percent of the total construction figure and maintenance costs do not exceed 1 percent of the total capital costs.

66-0072
Improve sanitation in Vietnam. Refuse Removal Journal, 9(10):10, Oct. 1966.

The state of sanitation in Saigon and other cities in South Vietnam is appalling. Local municipal refuse collection and disposal forces are unable to cope with an ever-mounting volume of solid wastes, and sporadic collection and disposal means that material may lie in the open for weeks and be washed into the streets before collection. Disease, flies, and rats accompany this filth. Since the Saigon government has neither the men nor equipment to cope with the rising tide of solid waste, a private refuse collection contractor from America might be called in to do the job.

66-0073
Many British towns charge for bulky refuse. Refuse Removal Journal, 9(1):28, Jan. 1966.

The problem of collection and disposal of bulky refuse is discussed. A survey of 76 municipal districts in Great Britain showed that about one-third of the sanitation departments charge for the pickup of bulky refuse, while 19 provide free hauling. Of the remainder, seven usually collect for heavy pickups but make some exceptions, 21 make charges in certain cases, and four have no provision for pickup. The amount and nature of charges for special collection services varies widely. The most frequent basis for charges is a combination of labor and transport costs, either at net cost or plus a small excess. Some variation on this method is used by 22 of the 76 surveyed British localities. The importance of publicizing the collection service to prevent illegal dumping, is stressed.

66-0074
Massive cleanup job costs city $33.4 million a year. Refuse Removal Journal, 9(8):15, 80, Aug. 1966.

Refuse collection and disposal in Chicago, Illinois, which has been cited five times in the past six years for having one of the nation's best cleanup and community improvement programs, are described. The Bureau of Sanitation's 1966 budget is $33.4 million. This covers refuse collection and disposal. street cleaning, snow and ice removal, rodent control, weed destruction, health code enforcement, and dead animal removal for a population of 3.6 million within 224 square miles. The Bureau cleans over 200,000 miles of streets a year and collects over 1.5 million tons of refuse, an average of over 5,000 tons per day; 70 percent of the material collected is incinerated at one of the city's three modern facilities. Two additional incinerators and three portable incinerators and grinding stations will soon be purchased for reducing bulky materials. About 30 percent of the refuse collected by the Bureau goes to three private contractor incinerators and sanitary landfill, which also receives thousands of tons of residue brought by transfer trailers. All material is handled at one 300-acre sanitary landfill site. The department's progressive programs include anti-litter campaigns and summer youth programs. During 1965, 700 boys cleaned 1,600 vacant lots and cut hundreds of acres of weeds. Preventive maintenance of equipment and the use of 125 containers have also increased efficiency. Rear-loading containers are at present undergoing tests.

Chicago also recently completed an intensive rodent control program covering all of the city's 20,000 blocks.

66-0075
Nash, G. E. Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. 121 p.

The study was carried out by the Maryland Technical Advisory Service at the request of the Board of County Commissioners. After defining the refuse problem and outlining the legal authority of local governments, it reviews current authoritative literature on refuse collection and disposal. It then describes briefly and factually the current refuse collection and disposal operations in nine municipalities of the County, and analyzes selected aspects of this problem to present some general considerations as a potential basis for future governmental action. The study does not present detailed engineering data. Appendixed are the Senate Bill No.5 (1966) and information on various refuse collection methods, comparative cost computations and principles for sanitary landfill operations.

66-0076
Nash, G. E. Refuse collection and disposal methods. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.6-10.

Exact descriptions of terms used in the study are given (refuse, garbage, rubbish, ashes, etc.) and attention is drawn to the storage requirements and collection frequency needs. Refuse is becoming a more combustible mixture. Geographic location, season of the year, economic and social level, and other special community characteristics have to be considered when designing community policies for a refuse collection and disposal service, and the amount of refuse to be disposed of should be determined by measurements. Detailed descriptions are given of the refuse collection and disposal methods together with information about financing.

66-0077
Nash, G. E. Hagerstown refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.75-80.

In the City of Hagerstown owners of commercial establishments deal directly with private refuse collectors. Collection service for residences is provided through a formal city contract with a private refuse collection agency. The conditions of this contract are specified. The refuse disposal site consists of sixty-two acres of land and the area method of sanitary landfill has been employed since 1956. Further information is given on labor and equipment used. The total appropriated for both collection and disposal in the City of Hagerstown was $2.33 per capita per year for the fiscal year 65-66.

66-0078
Nash, G. E. Hancock refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.80-83.

The population of Hancock is about 2,000. Refuse collection is handled by town employees, collections being made from all residences and business establishments in the town on a once-a-week schedule. The present method has been used for about eight years. Prior to that time, citizens dealt directly with private collectors. Disposal at the site is accomplished by preparing a trench (200 by 10 by 10 ft) into which refuse is dumped. Collection and disposal operations in Hancock cost about $2.50 per capita per year.

66-0079
Nash, G. E. Williamsport refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.83-87.

The population of Williamsport is about 1,850. Refuse collection is carried out through a formal town contract with a private refuse collector, the lowest bidder normally receiving the contract. The contract method has been employed for about seven years. The contractor collects refuse from all residences and business establishments once per week. The collected refuse is disposed of at a town-owned site supervised by a full-time employee. Combined annual costs of both refuse collection and disposal are about $3.75 per capita per year.

66-0080
Nash, G. E. Boonsboro refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.87-90.

The population of Boonsboro is about 1,200. Refuse collection is handled by a single private refuse collector who deals directly with town residents, picking up refuse twice weekly at a cost of $18.00 per year per household. In addition the town itself makes a twice monthly collection of cans and a periodic collection of larger items of trash. The present method has been employed for about 15 years. The town does not maintain any supervisory employees at its disposal site which is thus open to uncontrolled dumping by many individuals.

66-0081
Nash, G. E. Sharpsburg refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.91.

Sharpsburg's population is about 860. All refuse collection is handled by a private collector who uses enclosed compactor type trucks. Individual residents deal directly with the private collector. The town does not formally regulate nor license refuse collection services. Collection takes place twice weekly at a cost of $18.00 per year for each household. The town-owned disposal site is small and open only on Saturdays. No maintenance service is provided at the site.

66-0082
Nash, G. E. Clear Spring refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.93-94.

The population of Clear Spring is estimated to be about 500. Refuse collection is provided through a formal town contract with a private collector who picks up refuse from all residences and commercial establishments once weekly. The present contract costs about $2.00 per capita per year and the cost of the refuse collection contract is paid from general tax revenues. The present method has been employed for about four years. In addition the town itself conducts an annual Spring clean-up operation. Refuse is disposed of at the County disposal site west of Hagerstown.

66-0083
Nash, G. E. Funkstown refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.94-95.

The population of Funkstown is now estimated to be about 1,000. The town has a formal contract with a private refuse collector for the collection of rubbish, once weekly, from residences and commercial establishments. The annual cost of this contract is $0.75 per capita per year, being financed from general tax revenues of the town. Garbage is collected by a collector who deals directly with the individuals concerned. The cost is $18.00 a year for each household. Refuse is disposed at the County disposal site west of Hagerstown.

66-0084
Nash, G. E. Keedysville refuse collection and disposal operations. In Refuse collection and disposal in Washington County, Maryland. College Park, University of Maryland, 1966. p.95-96.

The population of Keedysville is now 475. Refuse collection is accomplished through a formal town contract with a private refuse collector, providing for twice per week collection from all residences and business establishments and including all types of refuse. The annual cost of the refuse collection contract is about $2.00 per capita per year and is financed from general tax revenues. Refuse is disposed of at the County disposal site west of Hagerstown.

66-0085
Nash, G. E. Smithsburg refuse collection and disposal operations. In Refuse collection and disposal in Washington County. College Park, University of Maryland, 1966. p.96.

The population of Smithburg is estimated to be about 670 today. Refuse collection is carried out through a formal town contract with a private refuse collector. The terms of the contract provide for the twice weekly collection of all refuse from residences and commercial establishments. The annual cost of about $4.00 per capita per year is paid from general tax revenues. General satisfaction is indicated with the present method, employed for about ten to fifteen years. All collected refuse is disposed of at a site located outside of Washington County.

66-0086
New solid wastes film premieres at Congress. APWA [American Public Works Association] Reporter, 33(10):13, Oct. 1966.

The film The Third Pollution illustrates such problems as the burning dump at Kenilworth, Washington, D. C., and San Francisco's controversial Bay disposal program. Also depicted are the Mission Canyon Sanitary Landfill in Los Angeles, New York City's massive collection and disposal requirement, the Hempstead, Long Island, incinerator, and composting and salvaging operations.

66-0087
Ohio Department of Health. Refuse sanitation. Columbus, 1966. 48 p.

Sanitation in refuse storage, collection, and disposal is discussed. Descriptions of storage equipment and recommendations for receptacle location and cleaning are included. Public, private, and contract collection methods are described, as are the various types of collection equipment. Among the refuse disposal methods considered, sanitary landfills are discussed in the greatest detail. Basic authority and financing are reviewed for the municipality, the county, and the township, and other laws relating to refuse sanitation are outlined.

66-0088
Ohio Department of Health. Refuse collection. In Refuse sanitation. Columbus, 1966. p.9-15.

A community may employ a public, a contract, or a private service for the collection of its refuse. With a public collection service, sanitation and public health are primary objectives; no profit has to be made. Municipal police powers may be used in getting proper storage. Such a collection system would require not only adequate financing, equipment, and personnel, but also sufficient public and financial support. Contract collection services are financed by private capital, and therefore must arrange sufficiently long contract periods. Contracts should allow for changing conditions, and should cover such points as types of refuse to be collected, frequency and location of pick-up, and type of equipment to be used. In private collection services, again private capital is used. Haulers should be required to meet minimum requirements in equipment and transport. Such a system seldom extends to all premises of one community, but the community usually must provide a satisfactory disposal method for the refuse. Collection of household refuse is seldom necessary more than once a week, while daily collection should be provided in commercial areas. Proper collection equipment should be leakproof, easy to clean, well-covered, and should have a capacity suitable to the size of the municipality being served. Packer-type trucks are most satisfactory, as they eliminate many trips to the disposal site. Success of a refuse collection system depends greatly upon strict enforcement and compliance with regulations.

66-0089
Ohio Department of Health. Refuse disposal. In Refuse sanitation. Columbus, 1966. p.16-26.

Good refuse disposal methods are essential to an adequate refuse program. Open dumps are unsightly and attract rats and flies, and well-isolated dumping sites involve expensive hauling operations. From a sanitation standpoint, hog feeding is a poor method of disposal, for a large amount of garbage is not eaten. Incineration is not a complete disposal process, but can eliminate most smoke and odor problems when designed properly. Composting is still in the experimental stage and has not yet been proven to be satisfactory for general community use. Household or business establishment garbage grinding avoids storage and collection problems, but central garbage grinding has not been shown to be practical. Sanitary landfill eliminates most problems associated with open dumping, and handles all types of refuse at the same time. Landfills can be established quickly at low initial costs, and can accommodate increasing populations. Sites must be within a reasonable hauling distance, and should not be subject to flooding. Sanitary landfill operation is usually carried on by either the 'area' or the 'trench' method, and utilizes tractors, bulldozers, and various light and accessory equipment. Recommended landfill operating practices are given.

66-0090
Ohio Department of Health. Municipal refuse collection and disposal. In Refuse sanitation. Columbus, 1966. p.27-31.

A municipality must provide some means of collecting and disposing of its refuse, and has ample authority to set up an adequate system. A municipality may adopt requirements concerning refuse handling, and set up a public system. It can also contract with individuals, private companies, a county disposal district, or another municipality to provide collection and disposal of solid wastes. A municipality may grant franchises or exclusive rights to individuals for collection and disposal service, and may appropriate land for disposal plants. A city also has the authority to finance the cost of purchasing land facilities and equipment, and the costs of operating collection and disposal systems. Such financing can be accomplished by means of a general tax fund, general obligation bonds, mortgage revenue bonds, or a voted tax levy. Each of these is discussed.

66-0091
Ohio Department of Health. County refuse collection and disposal. In Refuse sanitation. Columbus, 1966. p.32-34.

In setting up a public refuse-handling system, counties in Ohio have authority to establish collection and disposal districts outside municipal corporations and to adopt regulations concerning the operation of handling systems. A county may employ an inspector to enforce laws against nuisances and require approval of all refuse disposal systems set up in the county. Financing the purchase of land, facilities, and equipment may be achieved by the issuance of revenue bonds and by general obligation bonds. Service charges can help cover operational costs and pay off the bonds. A county may also contract with a municipal corporation, a township, or board of education for furnishing refuse disposal services.

66-0092
Proceedings; First Annual Meeting of the Institute for Solid Wastes, Chicago, Sept. 13-15, 1966. American Public Works Association. 78 p.

The first annual meeting of the Institute for Solid Wastes included a joint meeting of the executive councils of the Institute for Solid Wastes and the International Association of Public Cleansing. Six papers were presented. The subjects included: refuse collection, site location problems of refuse disposal, on-site handling of refuse, regional approaches to refuse disposal, characteristics of incinerator residue, and electronic data processing in a sanitation department.

66-0093
Public cleansing equipment at Olympia. Public Cleansing, 56(11):560-562, Nov. 1966.

Brief descriptions of equipment and vehicles soon to be displayed at the Olympia exhibition are given. Among the devices and vehicles were dustless loaders, container hoist equipment, an open top container with a liquid proof seal on the rear door, a trailer gritter, snowplow blades, snow blowers and snow loaders, and wastepaper handling devices.

66-0094
Puts standard units to fresh use. Refuse Removal Journal, 9(12):6-7, 10, Dec. 1966.

The refuse handling operations of the General Disposal Company, Peoria, Illinois, are described. The Company serves 11 communities and many large commercial and industrial establishments. It also operates two landfill sites. Among the contractor's unusual operations are its 'removable town dumps'--these are drop-off bodies placed in a number of far-flung farming communities which are picked up weekly. General Disposal also has been instrumental in placing stationary packers at two large industrial locations. On some of its residential routes, it makes extensive use of three wheeled scooters, some of which were modified to tow 3-yd containers. In Peoria and other larger communities, each packer makes up to 700 pickups per day. For Peoria, General Disposal's contract costs the city $0.84 per month per customer. Towns a great distance from Peoria present a transportation problem. A unique arrangement has been worked out with a number of outlying faming communities with 40-yd drop-off containers placed near the center of the small towns. For industrial and commercial collections, over 500 containers are used, 350 of which have 1-yd capacity. In addition, there are also nine 9-yd units, at industrial locations and a number of 40-yd Huge Haul containers. General figures direct operating overhead at $9 per hr, and is currently making an extensive study to pin down indirect costs. Over-all, it calculates that it must sell its service for $15 per hr. Routes are also subject to careful time and motion studies. The Company's equipment and landfill operation are described.

66-0095

Question accuracy of APWA solid waste report. Refuse Removal Journal, 9(10): 20-21, 30, 32, Oct. 1966.

In its August 1966 issue, the American Public Works Association Reporter published an article entitled ''Solid Wastes - the job ahead'', which presented the highlights of a report prepared by the APWA Research Foundation for the Subcommittee on Economic Progress of the Joint Economic Committee of the United States Congress. An in-depth review of this article, distributed at the American Public Works Association Congress and Equipment Show at Chicago, revealed serious errors, omissions, distortions and biased conclusions that may have a doubtful effect on future collection and disposal planning. The most glaring omission is that little or no attention has been given to solid wastes generated by commercial and industrial organizations, which amounts to about two-thirds of all refuse collected in the United States. A table published by the American Works Association depicting the breakdown of refuse collection practices by type of collection organization is misleading, providing the false impression that municipally-controlled collection is larger than privately-controlled collection. In the section on disposal facilities, their use, ownership and distribution, the APWA Research Committee has grossly under-estimated the number of private contractors using privately-operated disposal facilities, the total number of sanitary landfill used by our largest cities, and the percentage of facilities operated by private contractors. In terms of accuracy, the largest errors in the report occur in the data on collection vehicles. An independently conducted market survey of the sanitation industries shows that instead of the 30,000 to 40,000 figures mentioned in the APWA report, there are 53,000 municipally-owned and 95,000 privately-owned collection trucks used for refuse collection in the U.S. at the time of the report. The data on the cost of equipment is also questioned.

66-0096

Refuse disposal. Virginia Health Bulletin, 19, series 2(5):1-12, Sept. 1966.

The refuse disposal problem in Virginia and the steps being taken by authorities to deal with it are described. Suggestions to the individual citizen for helping with the problem are given. Among the topics discussed are: (1) the high cost of refuse collection and disposal; (2) the need for dumping facilities and a map of the 7,701 promiscuous dumps in Virginia; (3) the condition of household garbage cans as the source of trouble; (4) types of municipal refuse collection and disposal, including the open dump, which should be replaced, incineration, sanitary landfill, and salvage and compost; (5) citizen action and the concern of the State Health Department. The Board of Health is requiring cities, towns, and counties to file a report on how they are presently disposing of refuse in their jurisdiction and what plans they have for the future in order to provide information for future action. In addition, the State Health Department has received approval for a federal grant for refuse disposal planning.

66-0097

Rogus, C. A. Collection and disposal of oversized burnable wastes. Public Works, 97(4):106-110, Apr. 1966.

New York City has been studying the problem of oversized burnable wastes which cannot readily be collected in the normal truck or disposed in the conventional incinerator. Christmas trees per capita are 0.6 lb. Twenty-four thousand tons of trees, 28,000 tons of beach wastes, 122,000 tons of waste lumber, and 10--15 million tons of metallic non-burnables are removed annually. Miscellaneous bulky wastes total 58,500 annual tons. Larger items must be collected separately by manually loaded open-type dump trucks, assisted by hydraulic tail-gate lifts. On-site burning is limited to waste lumber and timber. Burning at sea is limited to driftwood fished out of harbor wastes. Salvaging methods are re-use, paper pulp manufacture and conversion of waste lumber into a charcoal-like substance by pyrolysis or destructive distillation. Unless pre-crushed or shredded, oversized items will arch or bridge within a landfill and create voids providing harborage for rodents and some insects. Disposal of chipped brush and timber has been practiced occasionally but is a slow process. Controlled burning can be done in open pit, portable incinerators, special fixed incinerators with single retangular, refractory lined furnace, or large central incinerators if over-sized items are reduced in size. A 'hogging system' adapted an abandoned hammer-mill shredder and apron conveyor to the conditions existing at the incinerator. Individual timbers of large size would lodge and inactivate the hammers in its vertical plane. The multiple shear and impact crusher types of Hoggers, used in Europe, can break up bulky wastes. The hogging operation is noisy and dusty so that suitable housing and dust control are essential.

COLLECTION AND TRANSPORTATION OF REFUSE

66-0098
Alabama city expands service with container trains. Refuse Removal Journal, 9(10):16, 18, Oct. 1966.

Since the population of Montgomery, Alabama, has expanded by over 50 percent in the last 15 years, the following steps were taken to supply efficient refuse collection service: (1) the City began charging a fee for refuse collection service; (2) introduction of container trains on many residential routes; and (3) detailed cost accounting. The direct billing was necessitated by the fast expanding residential developments and the higher cost of refuse removal service. Residents pay $2 per month, and commercial and industrial establishments using Dempster or LoDal containers must pay a fee from $4 to $40 per month, based on refuse volume, and may get pickups from 4 to 40 times a month at a rate of $3 per collection. Since far-flung routes were becoming more costly to service, ten container trains, serviced by three LoDal 28-yd front loading packers, were obtained. This system has resulted in reduced refuse collection time. Montgomery's cost accounting system has been invaluable when a unit needed replacement, and it has allowed the department to discover drivers who have been careless with equipment. The operations at various landfill sites in the Montgomery area are described.

66-0099
American Public Works Association. Committee on Solid Wastes. Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. 525 p.

The data that served as the basis for this edition was obtained by means of a comprehensive survey conducted by the APWA in cooperation with the United States Public Health Service, which tabulated the replies to the questionnaire. The individual chapters cover the following subjects: definition of refuse materials; preparation of refuse for collection; collection costs; equipment; supplemental transportation; special refuse; municipal, contract or private collection; financing; organization; personnel; equipment management; reporting, cost accounting and budgeting; and public relations. Appendices include excerpts from refuse collection ordinances and survey data and techniques. A selected bibliography is given for each chapter and a subject index is included.

66-0100
American Public Works Association. Committee on Solid Wastes. The refuse collection problem. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.1-12.

Refuse collection services are performed by government agencies, a refuse contractor under direct contract with the resident, or a refuse contractor under contract with the government. The amount of refuse varies with the season of the year, the quantity of garbage being greatest in the summer and yard rubbish more plentiful in spring and fall. Methods of getting refuse to collection vehicles include: transferring from curb containers, carrying containers from back doors or basements, exchanging full cans for empty ones, placing portable containers at strategic places, and use of disposable refuse bags. Collection equipment, trucks, trailers, container trains, and motorized carts, have to be maintained and replaced. Special problems are: control and regulation of scavengers and private collectors, removal of market refuse, handling of condemned food and dead animals, and management of clean-up campaigns. Good personnel and public relations must also be maintained. Studies are underway to determine the feasibility of using computers for refuse collection systems analysis.

66-0101
American Public Works Association. Committee on Solid Wastes. Refuse materials. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.13-41.

The terms used for refuse and its component materials are classified and define: garbage, rubbish, ashes, bulky wastes, street refuse, dead animals, abandoned vehicles, construction wastes, hazardous wastes, animal and agricultural wastes, and sewage treatment wastes. Total and per capita refuse production in the U.S. is shown in graphic and tabulated forms. Individual refuse production in 1965 was estimated at about 4.5 lb per capita per day or 1,650 lb per capita per year and is expected to continue at an increase of about 0.07 lb per capita per day or 25 lb per capita per yr. Daily and seasonal fluctuations and a statistical breakdown of the components of combined refuse (garbage, paper, wood, glass, ashes) are listed. There is a trend toward less separation of refuse classes on the premises and greater use of combined refuse collection.

66-0102
American Public Works Association. Committee on Solid Wastes. Preparation of refuse for collection. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.42-77.

From an administrative point of view, careful preparation of refuse is the key to successful operation of the disposal system. Disposal methods such as hog feeding, grinding, incineration, sanitary landfill, and composting, influence the separation of refuse. In order to insure better sanitation, garbage, rubbish and ashes are given special preparation such as draining, wrapping, boxing, and breaking up of large articles. The care, weight and size of various receptacles for refuse (garbage containers, plastic containers, paper bags and boxes, ash containers) are discussed. Location of containers during and between collections varies from place to place. Air pollution and quantity regulations affect residents and industry. Formal instructions are sometimes issued in the form of 'house cards'. Notices in local newspapers may inform citizens of informal or temporary regulations.

66-0103
American Public Works Association. Committee on Solid Wastes. Refuse collection methods. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.102-133.

Refuse collection methods used by municipal agencies are described and analyzed. Containers can be lifted to the shoulders, carried, or rolled on special carts. Emptying is accomplished by groundmen or men on trucks. The use of vehicles of the open body type is discouraged. Advantages and disadvantages of loading containers from curbs or alleys are covered. Refuse collection data from 23 cities using the Set-out and/or Set-Back system is tabulated. Various estimates place the additional expense of set-out and set-back at 25 to 50 percent over the amount needed for regular curb or alley collection. Methods of organizing work may be divided into two main types: (1) definite tasks are assigned to individual collection crews, and (2) operations of several or many crews are coordinated or integrated.

66-0104
American Public Works Association. Committee on Solid Wastes. Refuse collection equipment. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.134-147.

The kinds of collection vehicles used in the U.S. generally fall into three types: open trucks, enclosed trucks, and compactor trucks.

Data are given for types and sizes of collection vehicles used in 1964. The nominal size of the chassis ranges from 1½ to 8 tons, with the trend going toward even larger chassis, i.e., up to 15 tons. In evaluating the different types of collection vehicles available, the following factors should be taken into consideration: height of loading edge from ground; effective width of loading hopper; over-all loading space; time of loading and parking cycle; degree of compaction; safety hazards; ruggedness and ease of maintenance; appearance; cost; adaptability of equipment for other work; desirable turning radii and relative merit of compactor versus enclosed non-compactor or open-top vehicles. Illustrations of various types of trucks are included.

66-0105
American Public Works Association. Committee on Solid Wastes. Planning refuse collection systems. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.158-202.

In planning refuse collection, type of refuse, population density, physical layout of area, zoning, and climate are fixed elements. Factors open to determination are: responsibility for disposal, disposal methods, extent to which municipal, contract or private methods are to be used, materials to be handled, type of equipment, location of refuse for collection, and organization of crews. All policies fixed by councils, committees, or executives should be clearly stated in writing. The time of starting and stopping residential collections in 80 cities and commercial collections in 59 cities is shown. Analyses of unit costs using various sizes and types of equipment are also tabulated. City maps showing refuse production and hauling distances are illustrated. Preparation of schedules is discussed and a typical schedule is included. Typical collection plans are described for Cincinnati, Ohio; Hartford, Connecticut; Pasadena and Los Angeles, California and College Park, Maryland. Examples of time studies are given for Philadelphia, Pennsylvania.

66-0106
American Public Works Association. Committee on Solid Wastes. Supplemental transportation of refuse. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.203-219.

As a connecting link between the collection service and the disposal process the supplemental transportation system must equal in capacity, sanitation, reliability, and adequacy, the standards of the other parts of the operation. The kinds of transfer equipment in current use are described and the more important advantages and disadvantages of each are considered. Some municipalities use 5 to 10 ton trucks, semi-trailers, or a truck-tractor pulling a semi-trailer. Barges, scows, lighter, and special freight boats are used to transfer refuse from collection vehicles to disposal plants or dumps. One of the disadvantages of transferring refuse by water is that it may be impractical to move boats during storms. Typical refuse transfer installations are listed for selected cities and the economic analysis of supplemental transportation systems is shown graphically. A plan of a Washington, D.C. transfer station is illustrated. The necessity of providing transfer stations may serve to make some operations less economical than the exchange of vehicles or refuse collection bodies.

66-0107
American Public Works Association. Committee on Solid Wastes. Special refuse collection problems. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.220-235.

No major city now allows uncontrolled or unauthorized scavenging by individuals. Commerical and industrial establishments that are not given municipal collection service frequently haul their refuse to disposal points instead of employing private collectors. The advent of large, covered metal containers that can be located throughout the area of markets and large front-end loaders with the ability to load and pack the contents of the containers has provided the public markets with the solution to their refuse problem. Since food that has been condemned by health officials still belongs to the wholesaler or merchant, the owner or hired private collectors usually haul the condemned food to incinerators or landfills. The collection of dead animals, because of the emergency nature of the work, must be handled by special crews or contractors. The sweepings from street cleaning are collected by handbroom men or 'white wings'. Hazardous materials, large furniture, and oil containers are disposed of under special conditions. For many cities, particularly the smaller ones, annual or semi-annual collection of ashes and certain rubbish provides a suitable standard of service. Because of legal difficulties, it is generally better for municipal vehicles to use public right of way for passage.

66-0108

American Public Works Association. Committee on Solid Wastes. Municipal, contract or private collection of refuse. In Refuse collection practice. Chicago, Public Administration Service, 1966. p.236-267.

The terms used to designate the three types of collection: municipal, contract, and private are defined. In most cities and communities there is a combination of methods of collecting the various forms of refuse. Advantages and disadvantages of the three types of collection are compared. Specifications for contract refuse collection operations are given in a check list for use as a guide. Application forms for private collector's permits are illustrated. The optimum conditions for economical and effective removal service are realized when one agency conducts all of the work of removing all kinds of refuse from all properties. Any division of operations among two or more agencies, part municipal and part private, constitutes at least some duplication of equipment, labor, supervision, overhead, and control and usually leads to inefficiency, confusion, and higher costs. None of the collection methods can be made entirely free of the disadvantages of political interference unless impartial and thorough studies of the refuse problem are made from time to time.

66-0109

American Public Works Association. Committee on Solid Wastes. Organization. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.296-313.

Refuse collection is most frequently placed in a public works, sanitation, public service, or some other department that has responsibility for operating functions that involve engineering supervision. The most common arrangement is to group refuse collection and disposal and street cleaning together. Typical public works and sanitation department organizational charts are illustrated. Cooperation among various departments and divisions include: public health control of sanitary aspects; engineering supervision of operations and planning; police enforcement of regulations; and public relations counseling. In addition, equipment, personnel, purchasing, accounting, and other services must be provided by agencies outside the refuse collection agency.

66-0110

American Public Works Association. Committee on Solid Wastes. Personnel. In Refuse collection practice. 3d ed. Chicago Public Administration Service, 1966. p.314-335.

Wages and salaries usually account for from 60 to 80 percent of the cost of refuse collection. Of the 637 cities that reported on civil service status in a 1964 survey, 154 have placed all positions in the refuse collection agency under civil service. Since refuse collection is essentially a labor service, the personnel problems encountered are somewhat different than those of many other government agencies. Some special aspects of the problem are discussed such as recruitment, wages and hours, incentive systems, fringe benefits, working conditions and safety, employee training, employee suggestion systems, service rating, employee organizations, and labor-management relations. The actual basic and maximum wage for foreman, truck driver, and loader positions reported by 669 cities for 1964 are shown to range from less than $1 per hr to over $3 per hr.

66-0111

American Public Works Association. Committee on Solid Wastes. Equipment management. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.336-359.

The equipment organization generally includes maintenance; furnishing of licenses and insurance and may include storage, furnishing operators, purchasing and dispatching. For over-all design criteria of truck ability, S.A.E. procedures are a valuable guide for the selection of a chassis. Experience in Chicago has shown that a maximum gradability of 25 percent and maximum speed of approximately 35 mph, with a 5 speed transmission, provides a simple economical, easy-to-maintain unit for that city's operation (even with landfill type disposal). Some cities have established regular training for all drivers of refuse collection vehicles so that the equipment is operated properly and safe driving rules are followed. A survey of 738 cities in 1956 showed that 647 of the cities reporting indicated that they have motor vehicle public liability insurance. Equipment maintenance work sheets are illustrated. While many practices in the field of refuse collection must be decided on the basis of local conditions, the purchase, maintenance, and servicing of vehicles must follow accepted methods of good management.

66-0112
American Public Works Association. Committee on Solid Wastes. Public relations. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.381-406.

The refuse collection service must be particularly sensitive to its public relations role since its employees have so many personal contacts with citizens. Some cities have prepared public relations handbooks for all municipal employees. Group lectures, formal classes, manuals of practice, and personal instruction have all proved to be effective training devices for employees. Some cities delegate to inspectors the authority to adjust controversies and to explain possible difficulties. Typical refuse complaint forms and analysis of complaint forms are illustrated. Public education consists first of informing the citizens of what refuse collection service is available, the schedules and rules under which the service is carried on, and the obligations of the householder. Newspaper campaigns, public reports, speeches, radio broadcasts, television shows, motion pictures, and slides may all be a part of a 'clean up' campaign. When public relations fail, legal enforcement of ordinances and regulations must be undertaken. In some cities it has been found desirable to assign regular police officers to the refuse removal agencies.

66-0113
American Public Works Association. Committee on Solid Wastes. Refuse collection in 1964: selected data from 956 cities. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.449-472.

The questionnaire from which this data was derived was distributed in 1964 to all cities in the U.S. and Canada of more than 5,000 population. A total of 1,116 replies were received of which 956 were usable. The information was transferred to IBM cards and seven key characteristics of refuse collection were represented in the printout. Included in the data are: population; systems used (municipal, contract, or private); areas serviced (residential, commercial, manufacturing and industrial, institutional, and public); collection points (alley, curb, front of house, rear of house); set-out or set-back; frequency of collection; and method of finance (general tax, service charge).

66-0114
American Public Works Association. Committee on Solid Wastes. Analysis and planning of refuse collection systems. In Refuse collection practice. 3d ed. Chicago, Public Administration Service, 1966. p.473-503.

The University of California Sanitary Engineering Research Project carried on investigations in the field of community refuse collection and disposal in 1950 and 1951. A synopsis is given here of the data and analytical techniques developed from the study entitled 'An Analysis of Refuse Collection and Sanitary Landfill Disposal', Technical Bulletin 8, Series 37. This work is the first comprehensive scientific effort to develop basic refuse collection system design criteria on a broad basis that has been made in almost 3 decades. The data is based on California conditions and must be interpreted accordingly.

66-0115
Bigger and better at Bournemouth. Public Cleansing, 56(9):443-449, Sept. 1966.

A vehicle exhibition took place at the Nor'west Conference. The refuse collection vehicles included: the rotating drum system refuse collection vehicle 'The Shark'', a paper sack system of refuse storage 'The Musketeer', B. M. C.'s 'Tilt Cab', Sheppard Fabrications' 'Winch Unit', and S.M.T.'s 'Highway'. The street cleaning machines were: the street sweeper 'The New Era', a multi-purpose vehicle 'The Litterette', a trailer-type machine 'The Tintern', and a suction road sweeper 'The City'. Vehicles shown for winter emergencies were: the gritter 'Mini-spred', the snow plough 'Electro-lift', the street orderly 'Beaver', and the bulk gritter 'Bemos'. Also shown were a suction hose 'Flexilant', the snow shovel 'Snowaway', a dustbin 'Harcostar', a refuse container 'Ezelift', and a mobile incinerator 'Infurnirator'. There was also an earth moving machinery display which was hampered by high winds and sand.

66-0116
Bigger than ever at Bournemouth. Public Cleansing, 56(5):196-221, May 1966.

An exhibition of public cleansing vehicles and equipment was held in conjunction with the Institute's Conference at Bournemouth. The display included: (a) vehicles--tractors, gully emptiers, refuse collectors, compression bodies, continuous loader, suction sweeper, mechanical sweeper, vacuum cleaner, gritter, and salvage trailers; (b) earth-moving equipment--crawler, tractor shovel, excavators, bulk handling units, and hydraulic shovel; and (c) appliances and protective clothing-refuse storage system, brooms, dustbins, brushes, garments, sacks, and street orderlies.

66-0117
Black and Veatch, Consulting Engineers. Refuse hauling. In Report on refuse disposal for Northern Baltimore County, Maryland. Kansas City, Mo., 1966.

For minimum cost of refuse disposal, the collection routes and access roads to the disposal facility must be considered. It is advantageous for the disposal facility to be accessible via high-speed haul routes designed for trucks traffic. A 20 cu yd packer truck, hauling an average payload of 5 tons with a two man crew was used to complete hauling costs for this study of refuse disposal in northern Baltimore County. Since packer trucks are not economical over long distances or at less than full payload, the feasibility of a transfer station for the refuse, to transfer the load to large capacity tractor trailer trucks was considered. The fixed, variable hauling costs and the transfer station costs are developed with charts for the particular situations likely to be found in the study areas.

66-0118
Bowerman, F. R. Refuse collection--public or private? In Proceedings; First Annual Meeting of the Institute for Solid Wastes Chicago, Sept. 13-15, 1966. American Public Works Association. p.1-3.

Differences between public and private refuse collection systems were explored through an analysis of the three component parts of the system: administration and supervision, labor, and equipment. It was concluded that there are examples of the best in modern-day techniques in both public and private refuse collection and disposal systems. The most frequent cause of substandard performance by private industry is the failure of local government to prescribe minimum specifications for performance to protect public health and safety. Recent years have seen the gradual development of improved specifications for bidding on solid wastes collection and disposal contracts. It is probable that the entry of the federal government into the solid wastes field will now provide assistance to state and local governments in the development of criteria which will lead to the improvement of both private and public operations.

66-0119
Brothers build progressive firm with new techniques. Refuse Removal Journal, 9(3): 20, 42, Mar. 1966.

The operations of Shayne Bros., Inc., a refuse collection company in Washington, D. C., are described. The three Shayne brothers bought the business in 1945 for $3,750. In 1965, the company grossed over $1 million annually, with business expanding at about 10 percent a year. To handle its far-flung accounts in the Capital area, the company uses a wealth of equipment, including front and rear loading containers, roll-off bodies, detachable containers, stationary compactors, open trucks, and rear-end loaders. This diversified equipment assures that the right tool is available for the job. This phenomenal growth has been brought about by the use of advanced equipment, aggressive advertising, excellent employee benefits and relationships, computer billing, and the services of a management consultant. To keep nearly 60 vehicles and 3,500 containers in good condition, an efficient maintenance program is carried out. The Shayne shop operates 24 hr a day, so that packers may be serviced at night and downtime is cut to a minimum. The text of an aggressive radio commercial, put on the air by the company, in advertising for truck drivers, is presented.

66-0120
City of 270,000 takes step toward contract collection. Refuse Removal Journal, 9 (3):22, Mar. 1966.

Jersey City, New Jersey, has authorized itself to study the feasibility of turning over refuse collecting to private contractors. It has advertized for bids to get an idea of the cost involved. The Authority at present operates a large modern incinerator and a refuse vehicle fleet. It is estimated that collection costs $650,000 per year for wages, and $200,000 for insurance, maintenance, and repairs. Figures for other cost, including capital investment in trucks, garage, and other equipment, have not been gathered. Contractors who wish to submit bids must prove their financial responsibility and experience in the field before being allowed to pick up a set of specifications on which to base their bid. A contractor will possibly be obliged to use the same personnel now working for the city, and it is also likely the the contract will call for him to purchase the Authority's 25 refuse packers and rent the Authority's new garage, which is still without equipment.

66-0121
City slashes packer upkeep. Refuse Removal Journal, 9(8):74-75, 77, Aug. 1966.

Chicago expects to save more than a million dollars over the next few years by purchasing refuse handling equipment with a guaranteed maintenance program. In 1964, the system was started with the purchase of 75 collection trucks. It has since been successful enough for the city to buy another 75 packers with upkeep contracts. In addition, the city is purchasing 12 75-yd transfer trailers and 25 street sweepers under a similar arrangement. White Motor Company won the recent guaranteed maintenance-purchase contract for 75 trucks and chassis with a total low bid of $2,067,396, about half of which covers the cost of the trucks and the other half the maintenance for 6 years. The monthly unit upkeep will be accomplished for $197 per month. Chicago spends an average of $293 per month to maintain each of its present refuse trucks for 6 years. The $197 per month for maintenance on the new packers is thus nearly $100 per month less than the average price presently paid by the department to keep up its fleet of 514 trucks. The method of payment and the maintenance expected of the contractor as well as the jobs the city retains are described in detail.

66-0122
Cleaner refuse trucks mean fewer complaints, better morale. Public Works, 97(6):148B, June 1966.

Refuse is collected once a week in Kansas City, Missouri, with 38 refuse trucks and 18 flatbed trucks to hold garbage barrels from restaurants. They found that a Malsbary 400 HPC steam cleaner uses only half the detergent formerly required to clean a truck. The steam removes refuse, muddy dirt, and salty mud from snow removal trucks.

66-0123
The commercial motor show. Engineering, 202(5239):505-507, Sept. 16. 1966.

The International Commercial Vehicle Exhibition, to be held Sept. 23-Oct. 1, 1966, will display luxury buses, heavy duty goods vehicles, light delivery vans, and all other methods of moving merchandise by road. Sections will also be devoted to tires, components, and accessories. Sixteen of the exhibits are described with photographs of 12 selected trucks or pieces of machinery. Among those described are the Ford D series truck range and Ford Transit medium van range, the Pedigree Plus Straight Frame semi-trailer chassis, the 6LXB engine, hydraulic dumping gears for commercial vehicles, a container transfer unit, a bulk transporter semi-trailer, a fire-crash tender, a 5 forward speed gear box, the 30-ton GVW fifth wheel trailer, and Loadstar motor trucks.

66-0124
Contractor's feather run is heavy weight task. Refuse Removal Journal, 9(1):8-9, Jan. 1966.

The operations of a refuse collection company in Ontario, Canada, which picks up industrial and commercial refuse during the day and feathers from poultry processing plants at night, are described. By using 3 and 4 yd metal containers on casters, dumping them into a front-end loading packer and compressing them, it was possible to reduce their moisture content by 30 percent. The payloads could therefore be larger, and loading and unloading became much faster. The trucks, which cover 1,000 miles five nights a week deliver the feathers to a rendering plant where they are processed into feather meal, a high protein feed supplement for poultry. The personnel, shifts, and equipment maintenance, as well as special problems involved in the feather pickup operations, are described.

66-0125
Critchley, H. F. Refuse collection, Public Health Inspector, 75(2):83-97, 120, Nov. 1966.

Public cleansing is without doubt among the most important environmental health services. The powers of collection legislation are given to county boroughs, boroughs, urban and rural district councils. Refuse consists primarily of dust, ash, cinder, vegetable and putrescrible matter, paper, metal, rags, and glass. A refuse storage bin should be nuisance free with a well fitting lid and adequate capacity. Ninety percent of the dwellings use galvanized steel dust bins. However, plastic bins and plastic and paper sacks are becoming more popular. Storage points should be easily accessible. Fifteen percent of the premises have curbside collection and 20 percent have 'skep' collection. Other methods are the collection and return bins, dustless loading with special containers and vehicles, paper sacks, and chutes. The wide range of vehicles in use includes side loaders, rear loaders, compressors, dustless loaders and special vehicles for containers. On-site disposal of refuse is also becoming popular. The problem of disposal of bulk refuse and old cars is still increasing. Since paper is forming an increasing proportion of the volume of refuse, salvage is financially worthwhile. The conclusions reached summarized the essential regulations needed. A discussion of the paper followed.

66-0126
Dealing with refuse from high flats. Public Cleansing, 56(4):149, Apr. 1966.

The Greater London Council has decided on the use of a special 10 cu yd semi-trailer to deal with refuse from a tall block of flats. The trailers have an opening in the roof covered by two folding lids which, when opened, form a chute for the refuse. The trailers are backed into chambers in the buildings for loading. A mechanical tractor is used to move the trailers to the disposal site.

66-0127
Do sheep make good refuse collectors? Public Cleansing, 56(4):177-178, Apr. 1966.

Most of the towns of Rhondda Valley operate curbside refuse collection. (Due to the allocation of cheap coal to miners the weight of refuse per 1,000 population is 25-30 cwts per day.) Between the time the occupier places his bin outside his front gate and the collection team arrives, each bin is systematically visited by the sheep. During their 'rounds,' the sheep nose off the lids and knock over the cans to find every bit of edible refuse. These sheep, straying from small farms, are traffic hazards and are a menance to greengrocers. Because of the scavenging, some towns are considering the use of the 'Falkirk' bin--the lid being attached to the bin with a strap. Even at the so-called controlled tips, sheep and horses scavenge on edible refuse.

66-0128
Former hotel man expands Hawaii refuse company. Refuse Removal Journal, 9(4):22, 54, Apr. 1966.

The refuse operation of Kona Hauling, a refuse collection service on the island of Hawaii, is described. The company serves the north and south Kona Districts with headquarters in Kaulua-Kona. Because Kona Hauling is the only refuse collection service on the west side of the island, it handles homes, hotels, restaurants, and businesses. Hotels and restaurants get service seven days a week and are provided with 35 gal steel barrels. Residences get backyard pickup service, but residents often ask the collectors to do odd jobs for them. By nature of the land and people, some of Kona's refuse collecting presents unusual and often annoying problems. Cuttings from the thorny Bougainville a vine are hard to handle and the coconut palm fronds take up a great deal of room in trucks and have to be hacked into pieces manually. Collection crews are often found swimming in the Pacific and maintenance and repairs are done on a haphazard basis, because of lack of facilities and spare parts. Present equipment consists of a 12 cu yd Gar Wood packer body mounted on an International chassis, and a 1962 FC-170 Jeep 1-ton dump truck. Four full time men service about 250 accounts. Due to the concentrated area served and the fact that the county public dump is just two miles from the center of the village, the two vehicles travel only about 100 miles each week throughout the many villages.

66-0129
Gone with the wind. Refuse removal by pneumatics for Westminster. Public Cleansing, 56(10):495, Oct. 1966.

Westminster City Council's Cleansing Committee has recommended pneumatic refuse removal for use in a large apartment development. Vertical cylindrical chutes, instead of ending in a container room in the basement, are connected by a valve to a main transporter pipe through which refuse is drawn by a vacuum method to a central storage silo. A programming mechanism opens the valve and the refuse, pulled by the air current from extractor fans, moves to the silo at a speed of about 90 ft per sec. The chutes are successively opened until all are emptied. The cycle can be repeated as often as the volume of input refuse requires. An on-site incinerator can reduce the volume of the refuse by one-seventh and the weight by one-quater. Capital costs are estimated at $108 per apartment and annual operating costs at $5 per apartment.

66-0130
Hamburg's public cleansing department uses most modern machinery. Staedtehygiene, 17(2):42, Feb. 1966.

A fully-automated tunnel washing truck, a truck for crushing bulky waste, and an automated strewing truck now belong to the vehicle pool of the municipal administration of Hamburg. In 1965, 2.7 million cu m of waste were transported, corresponding to a daily rate of 3.9 liters per capita. A total of 1,000 workers and 225 specialized trucks are employed. Unusual accumulation of waste in households, such as occurs after holidays, is taken care of by using paper waste bags sold at 1.50 DM each by the City. (Text-German)

66-0131
Handles 30 city packer trucks daily. Refuse Removal Journal, 9(11):8, 10, 49, Nov. 1966.

A modern transfer station, which is designed to handle 145,000 yd of compacted refuse a year, has alleviated Denver's acute refuse disposal problem. Four 60-yd Hobbs Hyd-Pak transfer trailers handle 28 to 30 loads of refuse per day from 20 yd municipal packers. The total cost of refuse disposal via transfer stations and landfill is estimated to be $3.25 per ton based on an average one-way haul of 18 miles from five transfer stations in Denver to the Lowry disposal site. The transfer station is hydraulically operated; it creates hydraulic pressure from electric power rather than using separate combustion engines on each piece of equipment. At the present time, food wastes from restaurants and commercial food haulers are collected separately for hog feed. The city pays $170,000 annually to the Hog Growers Association for collection of these food wastes; in turn, the department receives $110,000 from these places in fees, making the deficit in 1965 for this function $60,000. It is therefore doubtful that this system will be continued for long, and further studies on refuse disposal for the Denver area are under way. Tabulated data include the Denver Metro area collection costs and the Denver Metro area solid waste collection.

66-0132
Hauler plays key part in Boston's development. Refuse Removal Journal, 9(2): 8-9, 50, Feb. 1966.

The refuse collection and hauling operations of the contracting firm of James A. Freaney, Inc., are described. In 1950, the company was awarded 5 refuse collection contracts for the City of Boston. Today, Freaney operates 28 truck-packers and detachable container rigs--exclusively for refuse removal. In addition, 25 trucks and various kinds of rolling stock are employed for the company's general contracting work. To handle this wide variety of tasks, the firm has 98 employees, including an 8 man maintenance crew and a large office staff. For municipal refuse collection in Boston the firm uses Leach Packmasters mounted on a variety of chassis. Containerization is used extensively for the company's many commercial, industrial, and construction accounts. Most restaurants, stores, and other businesses are served by a group of rear-loading Leach 2R Pack-masters mounted on Brockway diesel chassis. The units are fitted with container hoist systems which handle 1 to 8 yd units. Some of the major industrial accounts, however, get drop-off containers which are also hauled by Brockways. For its urban renewal and construction waste removal operations, the company employs Heil Huge Hauls and Load Luggers built around the Jafco system. The trucks work double shifts and a two-way radio communication system aids in the efficient use of the equipment. Since the company expects to get 5 years from each truck, an efficient maintenance system and premium grade oil and grease are employed. To preserve its public image the firm also keeps its trucks in a clean, odorless condition.

66-0133
Hawaii's aerial collection. Refuse Removal Journal, 9(11):51, Nov. 1966.

On the island of Kauai, refuse from hikers and campers in the Kalalau Valley is airlifted by helicopter to the town of Haena. To prevent the lovely area from being littered, 55-gal drums were donated by Lihue Plantation. Drums are collected free as a public service by Kauai Helicopters, which flies scenic flights along the rugged coast-line. Rental of the Bell Ranger craft is $120 per hr, and it takes about that long to haul out all the drums and return the empties. Drums are lifted by a cloth strap suspended from a cable winch below the helicopter.

66-0134
Lady mayor leads city to economic disposal solution. Refuse Removal Journal, 9(4):24, 58, Apr. 1966.

Since 1945, the Mayor of Salford, England, has worked day and night to rebuild the community's collection system. Now a modern up-to-date sanitation department is operating; baths and showers, a pension plan, 13 weeks a year sick leave after the first year, and job protection combine to make this one of England's most progressive public cleansing departments. The Mayor, Miss Bertha Davis, with the help of her able and progressive department chief, the late F.L. Stirrup, has raised the city collection operation to a high level, both in labor and efficiency. In 1954 adequate landfill space was known to exist for only 6 more years. After a study, the city decided to use a transfer station and large-capacity compaction hauling trucks. Now, a transfer station with salvage and dust separation operations is functioning, and three 30-yd Dempster Dumpmasters on 12 wheel Foden chassis and a Neville-bodied carrier (also on 10-wheel Foden) are used. At the transfer station, drivers in the trucks, beneath the two 50-ton capacity hoppers follow a series of light signals to operate their compactors. After filling and compacting, the driver goes to the washmobile where he sprays off any dust which may have accumulated, and goes to the weigher. Total time for the loading cycle averages 25 minutes and the average load carried by the transfer trucks is 7 to 9 tons; traveling time is 1 hr and discharging takes 10 minutes. Separating cost at the station averages about $1.00 a ton and bulk hauling about $1.03 a ton. After realizing income from salvage, net cost is about $1.50 (not including any dumping fees).

66-0135
Malkhazov, L. N. and Koryakovtsev, I. I. Measures instituted at Sochi to prevent the contamination of soil by household refuse. Hygiene and Sanitation, 31(1-3):381-383, Jan.-Mar. 1966.

Three methods of removal of household garbage in Sochi, U.S.S.R., are described: small (80-100 liter) metal garbage bins with lids; large 600 liter containers carried by special KMM 2-AKKh trucks; and refuse collection from apartment houses by M-93 dump trucks two to three times daily. The large 600 liter containers are used for collection of ordinary garbage from all warehouses, wholesale depots, garages, large shops, public gardens, parks, beaches, markets, etc. They are removed daily in special KKM-2 trucks and replaced by washed, disinfected bins. Food refuse from sanatoria, rest homes, restaurants, and certain other institutions is removed daily in the smaller containers by trucks of the Sochi sovkhoz to be used as pig-swill; some sanatoria and rest homes have installed refrigeration rooms for the temporary storage of this food refuse. In areas of towns without sewerage, contents of cesspits, latrines, and garbage pits are removed by ASM-2-3 trucks to a fecal station at the municipal sewage works. Studies of the collection of such food refuse from the population are being conducted.

66-0136

Mandatory pickups planned by county. Refuse Removal Journal, 9(2):39, Feb. 1966.

Suggestions of county officials to solve the serious residential refuse collection problem in West Contra Costa County, California, are presented. Since it was found that 15 percent of the homes in the area did not subscribe to any service, a compulsory refuse collection ordinance was proposed for the county. The county administrator suggested private contractors handle the job. However, according to the firm which collects refuse in the area, the big problem is collecting money under a mandatory scheme. Other suggestions included a provision in the ordinance that would allow a householder to dispose of his own refuse if it were done efficiently and under sanitary conditions, and that landlords should be responsible for refuse generated at rented property.

66-0137

Marchant, A. J. Closer look at refuse vehicles. Public Cleansing, 56(3):115-124, Mar. 1966.

Functions of refuse collection vehicles can be assessed by two criteria: the vehicle's ability and effectiveness to deal with refuse and the vehicle's technical design as related to construction and size. A procedure for obtaining test data of the refuse collection vehicles was devised; a minimum of three days is required for test purposes. A point system was also devised, to judge noise level, speed and effectiveness of hopper clearance, speed and ease of discharge, dust emission from vehicle and spillage, ease of loading, safety, and provision for carrying salvage. The points system was designed to give a realistic independent guide as to the merits of a particular vehicle and at the same time to give some indication as to what is the best buy. Attention was also paid to standard data, such as cost, delivery date, fuel consumption, volumetric capacity, height of loading rave, dimensions of loading hopper, manufacturer's stated compression with regard to refuse, size of vehicle (width, length, height and wheelbase), tare weight, turning circle, crew accommodation, ability for use as dustless loader, working performance of team, and additional information. From these factual details an analysis and comparison can be made in order to determine which is the most suitable vehicle for the purpose required.

66-0138

Mark II Sheppard/Meiller container. Surveyor and Municipal Engineer, 127(3839): 33-34, Jan. 1, 1966.

Two refuse containing handling units are shown and described in a company announcement of a new model. The Mark II Sheppard/Meiler unit is a development from the Mark I model and the new hydraulic system provides single lever control for the tipping hooks and jacks with an overriding jack control if needed. A second lever controls the main arms. The new valves are immersed in the main oil tank and give a no-loss system with little chance of air leakage into the 'hydraulics'. The 'fast lower system' for transferring empty containers from the unit to ground level can now be controlled from outside the cab as well as inside. One illustration shows the manner in which the equipment can lift a container located well below the ground level. A covered version with double lids is also shown in another picture. The new units are designed to raise a container from 2-½ to 3 ft below ground level. A less refined version is a derivation of the Mark I 6,000 model with a reduced loading platform. It has the advantage of a lower first price. The synchronization of the main lifting arm is obtained by the top tube where the anchorage of the lifting chains are located, although the external control of the Mark II pattern is retained. The price of the smallest Mark II unit is £ 1,600. Sheppards has recently introduced a line of heavy-duty dumper bodies with a 10 yd capacity body, a sandwich floor and a single-ram front-end dumper which gives a very fast dump.

66-0139

Mayrle, J. Multi-purpose trailer for collecting and dumping wastes in rural communities. Staedtehygiene, 17(12):259, Dec. 1966.

A new multi-purpose hydraulic dump trailer for rural communities has been developed to haul the wastes to nearby landfills. However, it can also be used for transporting any other freight. A tractor is used to pull the trailer. The trailer holds 4 cu m of waste. Three photographs illustrate various uses of the trailer. (Text-German)

66-0140
New cleansing vehicles at the commercial motor show. Public Cleansing, 56(11): 544-546, Nov. 1966.

A new Powell Duffryn Dumpmaster was shown. It was mounted on a six-wheel chassis, had automatic transmission, and a diesel engine. The same company exhibited an improved dumping device designed to make the most of the carrying capacity of a single rear axle 16-ton chassis. Sheppard showed a 'Rolonoff' unit capable of handling and dumping a variety of containers. Electric cars were also featured. Twenty-eight of these vehicles have been ordered for cleaning purposes by a London Borough.

66-0141
New underground garage for waste removal trucks in Freiburg, West Germany. Staedtehygiene, 17(6):139, June 1966.

The municipal department for waste removal in Freiburg, West Germany, built a new underground garage for 60 vehicles. The garage has electrically-operated sliding doors, automatic washing systems and maintenance and lubricating facilities. (Text-German)

66-0142
No transfer station yet. American City, 81(8):16, Aug. 1966.

A study in Sacramento, California, showed that a single site is the most economical. A transfer station cannot be justified economically, despite haul distance of 20 to 32 miles. Use of transfer stations should be restudied after 1975.

66-0143
A 1,200-acre cleanup job. Refuse Removal Journal, 9(3):36, Mar. 1966.

The grounds at Ford Motor Company's Rouge manufacturing area in Dearborn, Michigan are policed by 6 maintenance men, each equipped with a Cushman Dump Body Truckster. Before the end of 1964, this job was done on foot, and material was carried by hand. Now the fleet of 6 units collects trash, debris and litter, which is dumped into a Load Lugger container. These containers are picked up every day and the contents incinerated at the company's incinerator. Uncombustible materials, such as bottles and cans, are dumped into special metal boxes hung on the rear of the Trucksters' dump bodies and are then dumped into an open-top Dempster-Dumpster container for disposal at a nearby private landfill. In winter, the vehicles assist in snow removal.

66-0144
Packer serves as dump on Saturday. Refuse Removal Journal, 9(1):34, Jan. 1966.

To facilitate refuse disposal in Milburn, New Jersey with a population of 19,000, a township packer truck was stationed at the municipal garage every Saturday morning from eight until noon. Residents were encouraged to bring their bulk or extra refuse and deposit it in this packer. Since backyard pickup proved to be too expensive, other actions taken to keep the town neat included the assignment of a township employee to pick up litter and control the central business district. A full-time supervisor was also hired to see after regular refuse collection and that all regulations were being complied with by both the township and residents.

66-0145
Patrick. P. K. Transfer loading. Public Cleansing, 5(10):490-494, Oct. 1966.

A feature of refuse disposal development in the last 10 to 15 years has been the rapid growth in the number of transfer loading stations. There is a minimum distance from the final loading point of the collection vehicle at which the cost of transfer loading becomes justified, and there is a maximum distance which collection vehicles should be required to run to dump. The point at which the costs of transfer loading and direct run to dump coincide is the minimum distance at which transfer loading becomes an economic proposition. An assessment of the factors involved by the Dept. of Public Health Engineering was made and the method of approach and the conclusions reached are described. A preliminary study of two alternative systems was made: with transfer loading, followed by bulk transport, and without transfer loading (direct transport by collection vehicle). An algebraic model of transport costs was set up for each alternative and a comparison of transport costs was then made. It is concluded that the complex interactions of the various cost factors make it desirable that calculations should be used in conjunction with wider studies, and that the questions of siting and capacity of transfer loading stations, types of vehicles, allocation of disposal sites, etc., should be seen as interdependent.

66-0146
Process for cleaning aluminium. Public Cleansing, 56(11):585-586, Nov. 1966.

Aluminum road vehicles that are exposed to dirt and corrosion may be cleaned by a series of 6 products (Transbrite 1-6, manufactured by Cee-Bee Chemical Co., Ltd.). The process has three functions: cleaning off dirt; removing corrosion and brightening; and controlling corrosion by routine cleaning. Although there are six items in the process, not all would be required in every application, since the use of the various compounds would be determined by the condition of the aluminum. The characteristics and indications for the use of the six products are described in detail.

66-0147
Rapid transfer system speeds refuse collection. American City, 81(10):46, Oct. 1966.

A new transfer station in Denver, Colorado, consists of a two-story structure with two holding hoppers. The sliding bottom doors of the hoppers are left open permitting the refuse to fall directly into the transfer trailers.

66-0148
Rogus, A. Refuse collection and refuse characteristics. Public Works, 97(3): 96-99, Mar. 1966.

The trend has been toward handling of mixed, unsegregated refuse. Collection routes are governed by the probable total refuse output for any given period. Refuse size, density, and compactability determine equipment used. Incineration calculations depend on densities, moisture, calorific value and the amount of combustibles. Density and compactability of refuse is necessary for landfills. Pollutants are inorganic gases, organic substances, and particulate matter. Amounts of refuse collected per capita per year in Europe have risen progressively from 475 lb in 1953 to 725 lb in 1964. Density has decreased from 485 to 390 lb per cu yd. The collection trucks were fully enclosed units. European cities are using the hermetic, dustless system where special standardized containers are mechanically lifted, tilted, and discharged into the enclosed truck body and then returned to the ground level. Apartment house collection aids are dual type drop shafts, central pneumatic tube systems, and the Garchey hydraulic system.

DISPOSAL–General

66-0149
Air Pollution--1966: Hearings before a Subcommittee on Air and Water Pollution of the Committee on Public Works, United States Senate. 89th Cong., 2d sess. Washington, U.S. Government Printing Office, June 7-9, 14-15, 1966. 453 p.

The hearings discussed the problems of junked automobiles and beryllium disease, and related the progress made by the Office of Solid Wastes since its inception. The two proposed amendments were never passed.

66-0150
American Public Works Association. Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. 528 p.

The objective of this manual is to review past and present disposal practices, principally in the United States; to gather pertinent data, bearing in mind geographic and seasonal differences; describe and analyze the best current practices; broadly indicate the costs; and discuss administrative and management problems. Individual chapters deal with: waste analysis, composition of refuse, selection of disposal methods, sanitary landfills, central incineration, on-site incineration, grinding of food wastes, feeding of food wastes to swine, composting, salvage and reclamation and refuse disposal management. Eight appendixes present: tentative methods of analysis of refuse and compost, ordinance provisions for refuse disposal, full wording of two such ordinances, standards of the Incinerator Institute for design of home incinerators, National Board of Fire Underwriters 1958 standards for installation of domestic incinerators, the Solid Waste Disposal Act, and the rules and regulations pertaining to grants for solid waste disposal projects.

66-0151
American Public Works Association. Introduction. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.1-19.

Against the background of Governmental responsibility, as stated in the Solid Waste Disposal Act, 1965, the introductory chapter outlines the evolution of disposal methods and defines the problem from a presentday viewpoint. Refuse materials are classified by kind, composition and sources, with special attention given to the terms 'waste, refuse, garbage, rubbish'. A separate class is 'hazardous refuse' which usually necessitates evaluations in terms of quantities to be handled.

66-0152
American Public Works Association. Quantities and composition of refuse. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.20-54

The amount of refuse is the starting point in consideration of waste disposal. Measuring practices are outlined and factors are discussed which affect the differences between quantities produced, collected, and disposed of. To illustrate this point, the results of the APWA refuse studies in 12 cities are tabulated and evaluated, indicating amounts of refuse collected separately and in total, geographical and seasonal differences and effects of collection methods on disposal. The median figure for quantity of refuse collected is 1430 lb per capita per yr in Hartford, Connecticut. Complete analyses of the physical and chemical composition of refuse are seldom made, since each disposal method requires different information. Analyses for incineration, sanitary landfill, and composting are accompanied by tabulated data on calorific values, moisture and ash content of refuse and by physical analyses of refuse by weight and volume. Compaction characteristics of refuse are dealt with in a separate section; the plotted results of compression tests on household refuse from garbage cans show the increased densities produced by various compaction pressures.

66-0153
American Public Works Association. Selecting disposal methods. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.55-88.

Essential operations are reviewed for the methods of sanitary landfill, central incineration, on-site incineration, grinding and feeding of food wastes, composting, salvage and reclamation, and dumping. The selection of the best method for the existing needs must be done in view of the local legal restrictions. The above mentioned disposal methods are evaluated in terms of the public health aspects to be observed. Other factors discussed are the characteristics of the city and the capital and operating costs. The coordination of collection and disposal methods is stressed and several special disposal problems are raised such as the handling of the refuse from disasters, condemned foods, hazardous refuse, industrial wastes, construction and demolition wastes, dead animals, automobiles, leaves, and trees. The advantages and disadvantages of the contract disposal services are presented. The selection of a proper disposal method must also take into consideration the acceptability of the method by the public.

66-0154
American Public Works Association. Feeding food wastes to swine. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.253-278.

It is estimated that more than 10,000 tons of food wastes, or about 25 percent of the total quantity of garbage produced, are used for feeding daily in the United States. A group of hog feeders who raised approximately 54,000 pigs on 26 farms by feeding them raw garbage found that a capital investment of more than $400,000 was needed to process solid and liquid wastes produced on their farms in a manner that met local public health standards. Approximately 106 tons of solid wastes (wet basis) and 50,000 gal of liquid wastes were produced each day. Various problems and nuisances, both to humans and animals, in view of the local, state, and federal regulations are stated. Characteristics of garbage used for feed, and methods of cooking garbage are explained. Tables present data on average garbage costs, tons of garbage collected annually in three cities, and the frequency of refuse collections in residential areas of 908 cities. Indications are that this method of disposal will be used for some time still, and the effects of garbage feeding on refuse collection are described. Consideration is given to the layout and design of piggeries on the basis of preliminary planning requirements.

66-0155
American Public Works Association. Tentative methods of analysis of refuse and compost. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.375-399.

This appendix is the compilation of proposed methods for the examination of solid and semi-solid wastes, particularly domestic refuse. The tests were selected because of practical experience with them in several comprehensive municipal studies. Ten separation categories of refuse are suggested and the requirements of initial sampling are outlined. The following tests were included: moisture (Oven drying, Infrared, and Toluene distillation methods), volatile solids and ash, lipids, liquids, crude fiber, sugars, starch (Anthrone-Sulfuric acid and Direct acid hydrolysis methods), carbon, nitrogen (Kjeldahl-Wilfarth-Gunning method), protein, carbon-nitrogen ratio, phosphorus, potassium (Flame photometric and Sodium tetraphenyl borate methods), hydrogen-ion concentration, gross calorific value, net calorific value, sulfur, and for hydrogen and carbon. Introductory general instructions specify the environmental conditions, size or shape of sample, and the drying requirements. Description of each test covers equipment, reagents, procedure, and calculations.

66-0156
Archer, G. A. Municipal refuse disposal. Public Health Inspector, 74(10):432-436, July 1966.

This paper attempts to cover each of the accepted refuse disposal methods. Tipping, when properly controlled, is a cheap, effective method of refuse disposal. The practice of transferring refuse from the collection vehicles into bulk carriers for transport to distant tips is increasing in popularity. The reduction of refuse by pulverization presents some solutions to the problems of tipping. Refuse disposal by composting initiates several problems, but has many advantages also. Mechanical handling equipment saves labor, ensures hygienic working conditions, and conserves ground space. Screening and salvage of refuse helps to defer the cost of refuse collection and disposal by giving a salable item. The incinerator requires great care to be taken in chimney emission, but they present the most efficient method of modern refuse disposal. Industrial incineration is a field where much research and development has taken place in the last few years. The whole problem of refuse collection and disposal is a major one which cost England the total of close to $100 million every year.

66-0157
Black and Veatch, Consulting Engineers. Report on refuse disposal for Northern Baltimore County, Maryland. Kansas City, Mo., 1966.

The possible permanent disposal methods available to northern Baltimore County are considered from the aspects of cost, site availability and appropriateness, hauling costs, possibility of pollution, and public reaction. Incineration and sanitary landfill proved to be the two most promising possibilities and complete investigations as to actual sites, size, design of the facilities, costs (capital and operating), hauling costs etc. were considered and the figures, charts, and tables detailing the findings are included with the reasons for the actual recommendations. Transfer stations for hauling the refuse in large capacity trailers rather than the collection vehicles themselves are recommended. Incineration was the method recommended due to lack of suitable sites for long term landfill operations. The soil composition was such that water pollution was a serious hazard due to landfill operations. A sample of the Industrial and Commercial Refuse Questionnaire used, landfill site maps, and the Report on Interim Refuse Disposal Facility for Baltimore County, Maryland are appended.

66-0158
Black and Veatch, Consulting Engineers. Refuse quantities. In Report on refuse disposal for Northern Baltimore County, Maryland. Kansas City, Mo., 1966.

Present and future quantities of refuse in the study area of northern Baltimore County were determined along with population served, degree and types of industrial and commercial activitity and projections of these figures to prepare recommendations for refuse disposal in the area. The per capital residential production of waste was estimated at 1.7 lb representing 52,000 tons for the year. One and three-tenths lb per day is the estimated industrial and commercial refuse, most of this refuse is combustible and only a small per cent is large bulky items. The quantity of refuse varies seasonally. The solid wastes produced in the area can be disposed of in a properly operated sanitary landfill, with 750 tons per day as the estimated daily capacity for 1980 of both residential and commercial refuse. Incineration as a disposal method would be more expensive and it can be expected that unless required by law, commercial refuse may continue to be handled by private handlers at lower cost. The size of the incinerator is suggested to be able to handle 100 percent of the residential refuse and 50 percent of the commercial, at maximum loading in 1980 with all furnaces operating at rated capacity continuously for 7 days. Handling additional refuse from outside the study area may be desired during the early years of operation to assure maximum use of the facility. Data, graphs, and charts are included.

66-0159
Braun, R. On the question of groundwater spoilage by deposition of slag and compost. Schweizerische Bauzeitung, 84(36):637-638, Sept. 8, 1966.

The question of the effects of incinerator ash and of composted waste on groundwater (O. Wolfskehl and E. Boye, Schweizerische Bauzeitung 1966, No. 3, pp. 61-63, and No. 19, p. 358) cannot be decided on the basis of results obtained in laboratory experiments. Too many factors are involved which make it necessary to conduct the investigations at disposal sites. The composition of slag varies greatly so that no generally valid results can be obtained from samples of just one kind of slag. No data are given as to the amount of water used for the extraction. Moreover, it is not clear how the result should be understood in terms of mg per hectare. Since the question of how greatly the groundwater is influenced by either deposited slag or compost is so important, slag samples were dried at 105 C. Finely ground slag (50 g) was extracted in 400 ml distilled water for 24 hours. The same procedure was followed with compost, using as much as needed to obtain 50 g of ash when burned. In slag taken from a Lausanne (Switzerland) incinerator, the amount of soluble substances found was 2.3 percent on the basis of dried slag. In fly ash the content was as high as 15 percent. With various kinds of compost it was found that the amount of soluble substances fluctuated between 3 and 6 percent. No general conclusions are drawn from these results. (Text-German)

66-0160
Burning on a barge stirs controversy. Refuse Removal Journal, 9(6):38, June 1966.

The Disposal Company of Seattle set off a hot controversy when it recently fired a barge load of commercial and industrial refuse in Puget Sound. The waste was ultimately towed to a sanitary landfill for disposal. The company claims lack of economical dumping sites near the city was the reason for experimenting with this method of waste disposal. The city-owned landfill charges $15.00 per ton for dumping. Disposal Company takes most of its material to the 300-acre landfill it leases from the Tulalip Indians, 30 miles by water from downtown Seattle. The Army Corps of Engineers in Seattle has been burning debris aboard a specially outfitted barge for many years.

66-0161
Challenge of tomorrow's jobs. Refuse Removal Journal, 9(6):16, June 1966.

Pressure is mounting for strict air pollution and refuse disposal measures, such as the recently passed law in New York City. Changes generated by such action will necessarily lead to new equipment and technological improvements. Contractors may have to adapt their equipment to new handling methods. Incinerator equipment manufacturers, producers of stationary packers, refuse sack compression machines, pulpers, paper and plastic bags, and pulverization plant builders will all be involved and must be prepared to meet the new challenges of the growing industry.

66-0162
Changing nature of refuse. Compost Science, 7(2):18, Autumn 1966.

Volume has replaced weight as the yardstick for estimating waste disposal problems. Total volume is 60 million cu yd per year, requiring 6,000 acres of land. Densities of 5.6 cwt per cu yd have dropped to 3 cwt because paper, cardboard and metal have increased, and vegetable matter, reduced.

66-0163
Christmas aftermath. American City, 81(12): 30, Dec. 1966.

The disposal of Christmas trees is no longer a problem in Hartford, Connecticut. The discarded trees are collected, run through a chipper to reduce their bulk and deposited in a sanitary landfill. Some cities salvage the chips for use as a mulch in the parks, while others tow their chippers through the streets, decimating the trees on the spot. The use of artificial trees, which can be used year after year, has also helped to alleviate the problem.

66-0164
Control marine disposal. Refuse Removal Journal, 9(9):30, Sept. 1966.

The Boston Marine Refuse Disposal Company is using a polyethylene dam called a 'Slickbar', to confine floating materials as refuse is dumped into the harbor. The 'Slickbar,' which is a continuous barrier of polyethylene floats, will confine refuse, oil spillage, stream-surface pollution, and debris. Dumping landfill into the harbor may be used to extend shore lines.

66-0165
Environmental pollution, a challenge to science and technology. Report of the Subcommittee on Science, Research, and Development, to the Committee on Science and Astronautics, U.S. House of Representatives, 89th Cong., 2d sess., Serial S. Washington, U.S. Government Printing Office, 1966. 60 p.

The report states that although complete solutions to pollution problems may not be possible, two alternatives are feasible. First, materials can be recycled more efficiently and secondly, unuseable wastes can be transported to some type of perpetual safe storage. In the area of pollution abatement, government finding is indicated as a means to construct large scale demonstrations of new methods. These will help establish efficiency and cost norms. Another benefit of the government funding will be that it will stimulate new developments in the pollution abatement field. The report also includes various recommendations to Congress including one encouraging them to review its authorizations and appropriations for water, reclamation, transportation, and conservation in the context of environmental quality goals.

66-0166
European disposal methods reviewed. Compost Science, 7(2):18, Autumn 1966.

Europeans consider composting a clean and sanitary refuse disposal method with a useable by-product. Compost value ranges from $ .70 to $7.50 per ton and salvaged metal from $2.15 to $18.50 per ton. Plants in Paris and Germany can recover waste heat in amounts ranging from 2.0 to 2.7 lb of steam per lb of refuse burned. United States plants can only recover between 1.0 and 1.5 lb.

66-0167
[illegible]fe, J. A. European refuse-disposal. [illegible]erican City, 81(9):125-128, Sept. 1966.

Europeans salvage metals, paper, textiles, and glass. Composting and incineration are the most commonly used methods of disposal. Waste heat is recovered in amounts ranging from 2.0 to 2.7 lb of steam per lb of refuse burned as compared to 1.0 to 1.5 lb of steam per lb of refuse burned in the U. S. Electrostatic precipitators help remove fly-ash which contributed to air pollution. The plant ventilating system controls dust and odor. Dust laden air flows through ducts to an air washer or a bag filter for removal of dust.

66-0168
Gilbertson, W. E., R. J. Black, and K. Flieger. Meeting the challenge of solid waste disposal. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.49-53.

The present practices of solid waste collection and disposal are improper and inadequate. Graphs show the anticipated amount of solid wastes that will have to be collected, processed, and disposed of in the coming decades. It is estimated that communities are now spending over $1.5 billion a year for solid waste handling. A trend toward individual collection, coupled with centralized disposal of solid wastes has developed. Most states today lack the legislation which would permit and encourage the formation of special-purpose districts for solid waste management or allow counties to provide these services. The Federal Government, as a result of the Solid Waste Disposal Act of 1965, is now in a position to provide the needed leadership and financial and technical aid by initiating and accelerating a national research and development program for new and improved methods of solid waste disposal, and providing assistance to State and local government in the planning, development, and conduct of solid waste programs. The Office of Solid Wastes created by the Act will undertake a research program, conduct demonstrations, initiate training programs, etc. principally through grants-in-aid which will be awarded to public and non-profit private agencies. The act authorizes appropriations of $19.2 million for the 1968 fiscal year and $20 million for 1969. The major provisions of the act are summarized.

66-0169
Goven, F. A. On-site handling of refuse. In Proceedings; First Annual Meeting of the Institute for Solid Wastes, Chicago, Sept. 13-15, 1966. American Public Works Association. p.22-26.

Tenants of apartment buildings dispose of their refuse by five general methods: (1) placing all refuse in containers for periodic removal; (2) placing the wet garbage in a garbage disposal unit and the dry refuse including cans and bottles in a chute for central collection; (3) the same as (2) except compacting the dry refuse on-site; (4) placing wet garbage in a specially designed sink unit with the dry refuse placed in a container; and (5) placing the refuse in chute-fed incinerators with periodic removal of the residue. The central chute concept is considered the best method for meeting all of the criteria of a tenant and owner. Food waste disposers are able to handle most of the susceptible waste, except the non-combustibles. Where multiple chutes for large multi-family structures are used, the collected refuse from each chute is placed in wheeled containers and disposed of by a destructor-type incinerator, hammer-mill device, or compactor. It is possible to design, install and operate an incinerator consistent with air pollution laws. In considering compaction systems, a proprietary system which utilizes a pneumatic ram to compact the refuse into paper sacks or plastic containers has a number of significant advantages. It is believed that in the future there will be improvement and implementation of liquid-borne disposal systems to solve the problems of apartment house disposal.

66-0170
Hickey, J. H. The problem in detail. In Solid Wastes Management; Proceedings; National Conference, Davis, University of California, Apr. 4-5, 1966. p.35-44.

A description is given of the Bay Area's refuse disposal problem, based on a study of August 1965. The study was included as a part of the regional planning program of the Association of Bay Area Governments. The results of the survey indicate that approximately 2,868,000 tons of refuse were disposed of in the seventy-seven disposal sites in the Bay Area (the estimated population of the nine-county Bay Area in 1963 was 4,078,800). Thus the per capita production for the various counties ranged from a low 1.8 lb per day to a high of 5.5 lb per day, in San Francisco. An evaluation of the 'special wastes' problem was attempted, the results being tabulated with indications of descriptions of waste, tonnages, and methods of disposal. Refuse disposal in the Bay Area is almost exclusively by means of sanitary landfill. Private interests control a great majority of the currently available disposal capacity. In 2000, the Bay Area will be producing about 6,900,000 tons, or slightly over 10,000 acre-feet, of refuse per year. Between the years 1963 and 2000 a total of 182 million tons of refuse will be produced, which will require over 265,000 acre-feet of volume. Detailed recommendations are listed for measures to be taken.

66-0171
Hill, G. Heaven or aerial dump? Public Health Service World, 1(11):7-10, Nov. 1966.

There are prospective changes in trash disposal, home heating, and automobiles. Damage is done to materials, crops, health, and general livability of communities. The Federal government has asserted control in only two areas--interstate air pollution and automobile fumes. Air pollution from stationary sources is considered the responsibility of state and localities. When solid waste is burned, it becomes a gaseous waste problem. If it is allowed to contaminate waterways, the solid contaminants are extracted and burned exchanging one form of pollution for another. To avert the exchange, California has centralized by-product plants. Los Angeles has started abolishing backyard incinerators, reorganizing rubbish and garbage collection, deactivating municipal incinerators, replacing burning dumps with landfill disposal, and replacing coal with oil. Federal officials are tightening emission limits on hydrocarbon and carbon monoxide of exhaust fumes. Estimates vary. Fortune magazine said 2/3 of the nation's air pollution could be eliminated for $3 billion a year. If the atmosphere continues to grow more polluted, a century from now it will be too toxic to permit human life. Carbon dioxide, a major product of combustion, absorbs heat and helps maintain a balance between incoming solar energy and the earth's heat radiation. In 35 years there will be 25 percent more carbon dioxide, possibly causing marked changes in climate.

66-0172

International workgroup on waste research. Wasser und Abwasser, 107(46):1320, Nov. 18, 1966.

The international work group on waste research (IAM) has published an item (Information Sheet No. 26, Apr. 1966) containing the following articles: G. Rolle: On the determination of the quality of ash and slag of waste incinerator plants; B. Orsanic: Method for the determination of carbon in the decomposable organic substances in waste slag; B. Novak et al.: Annual variation of sewage sludge and the sieve analysis curve of municipal waste; A. v. Hirschheydt: On the determination of the prospective market of waste compost; and J. de la Rubia: The dedication of a waste composting plant in Madrid. (Text-German)

66-0173

Knee-deep in garbage. Public Cleansing, 56(7):313-314, July 1966.

The impact of disposable paper dresses for women on refuse collection and disposal systems and costs is discussed. The dresses have a life expectancy of four to six days, depending on usage and weather. It is thought that summers in Britain are likely to impose severe seasonal limitations on paper dresses. There is a suggestion that the Government intervene by taxing paper dresses by length.

66-0174

Lessons learned from Hurricane Betsy. American City, 81(4):93-96, Apr. 1966.

In the wake of Hurricane Betsy, the city of New Orleans found that the following areas of municipal service needed strengthening: (1) more auxiliary power sources, thoroughly weatherproofed; (2) emergency food and water supplies; (3) assured supplies of gasoline and diesel fuel; (4) greater and more strategic distribution of equipment; and (5) improved communications. Other lessons learned were that the large covered refuse collection trucks performed extremely well in evacuation and rescue work, and the diesel power street sweepers performed well in salvaging as much of the flooded equipment as possible. Exchanging the general purpose buckets on many of the front-end loaders for the clam-shell type facilitated the removal of fallen trees.

66-0175

Michaels, A. Report on refuse disposal for Niagara County, New York. Philadelphia, 1966. 42 p.

Recognizing that proper refuse disposal is essential to the development of an urban community, the Niagara County Planning Commission set out to determine the adequacy of present practices and to develop a plan for future needs. Findings showed that the two municipal incinerators are being operated in a commendable fashion. Of the twelve public and one private landfills used for refuse disposal only the City of North Tonawanda's River Road landfill and the City of Niagara Falls incinerator residue landfill are operated in a satisfactory manner. There is a severe shortage of space available for refuse disposal in the southwestern part of the County. It is recommended that all refuse disposal landfill sites in the County be operated as sanitary landfills in accordance with the State Sanitary Code. Special industrial refuse such as high heat plastics and rubber should be disposed of by industry since this type of waste in large quantities is a serious deterent to proper municipal disposal operations. It is recommended that eventually the County should operate all public landfills, incinerators and other facilities. Specific recommendations for existing refuse disposal facilities are given.

66-0176

Michaels, A. Present refuse quantities. Present disposal practices. In Report on refuse disposal for Niagara County, New York. Philadelphia, 1966. p. 15-32.

To obtain refuse generation information for the County, a survey questionnaire was prepared and sent to cities, towns, villages, school systems, and industries. The survey revealed that three cities provide collection service with city forces for all residential and some commercial establishments; many of the large industries use their own forces and equipment for hauling refuse. A substantial portion of the village and township residences and commercial establishments are served by private haulers either by direct contract with the individuals served or by contract with the village or township. A considerable part of the industrial refuse accounted for in the survey, 94 percent, is non-combustible. Present disposal practices consist of burning dumps, incinerators, and landfills. Several of the large refuse producing industries operate their own landfill sites or on-site incinerators. The cities of Niagara Falls and North Tonawanda both operate incinerators for the disposal of normal household refuse including garbage. Evaluations of various publicly owned or operated landfill sites throughout the county are given.

66-0177

Michaels, A. Future refuse quantities. Disposal practices--other communities. In Report on refuse disposal for Niagara County, New York. Philadelphia, 1966. p.33-41.

Many factors influence changes in the amount of refuse which will be generated in Niagara County in the future. Foremost among these factors are population change, industrial change, and changes in people's living habits. Assuming per capita refuse quantity increases continue at the 2 percent per year rate, and industrial refuse quantities continue to increase at a 4 percent per year rate, the refuse quantities expected for 2,000 A.D. would be: residential and small commercial, 330,000 tons per year; industrial-non-combustible, 1,100,000 ton per year, and industrial-combustible, 72,000 ton per year. Other refuse disposal methods which have been used or tried in the country include hog feeding, garbage reduction, salvaging, composting, and grinding. A survey of other communities concerned with refuse disposal shows that most are replacing open burning dumps with sanitary disposal methods such as sanitary landfilling and incineration. Municipalities have joined together to establish refuse disposal agencies on a regional or county level.

66-0178

Mix, A. Solid wastes: every day, another 800 million pounds. Today's Health, 44(3): 3 pp. Mar. 1966.

By 1980 urban communities are expected to produce three times as much solid wastes as the 800 million lb produced daily now. No one speaks of the 1,420 lb of refuse collected from each urban American each year. Refuse collection and disposal costs $1.5 billion. Plastics are almost immune to biological decomposition and present difficult disposal problems. When burned, they emit hydrocarbons and nitrogen oxides. Recommended standards for sanitary landfills and incinerators have been set by the U. S. Department of Health, Education, and Welfare. Refuse disposal should never be a permanent land use; it should be a way of making land suitable for permanent use. The following are examples of disposal means now in practice or being investigated. Boston is studying a plan to convert a ship into a mobile incinerator and send it to sea where ashes may be disposed. Old cars cannot be buried or dumped at sea; they must be moved more quickly and in greater numbers into the consumption channel as scrap. Composted refuse has potential as fertilizer and soil conditioner, but most U. S. plants have failed to establish a market.

66-0179

National Academy of Sciences--National Research Council. Waste management and control. Publication No. 1400. Washington, 1966. 257 p.

The Committee on Pollution of the NAS/NRC prepared this report for the Federal Council for Science and Technology. The nature of the pollution problem is described and areas where science and technology could effectively assist in reducing and controlling pollution are identified. Solid waste disposal has had the least scientific consideration of any of the problems of pollution control. Use of incineration, sanitary landfill, and special problems of agricultural and industrial wastes are covered. Much waste material could be reduced to forms that can be carried away in existing water-disposal systems. The future goal is the complete re-cycling of all materials consumed and subsequently discharged. The development of land-monitoring also has not progressed to the degree of sophistication now apparent in other fields. Land-management procedures must be instituted to reduce contamination. Separation of land and water into distinct classifications for pollution abatement is not practical.

66-0180

The old trash dump is obsolete. Engineering News-Record, 176(15):20, Apr. 14, 1966.

Speakers at the National Conference on Solid Wastes Management at Los Angeles made the following statements and gave the following recommendations. It is estimated that it will cost at least $1.5 billion a year for the next 10 years just to keep solid waste pollution at its present state of control. Air, water, and solid waste pollution are interrelated problems and should be tackled by merging the various civic pollution agencies now operating in many areas to consider the total cost and complexities involved. The best kind of pollution control is not to produce waste, and long-range planning is essential. The importance of educating the public concerning the urgency of the waste disposal problem was stressed, as was the fact that incineration is no longer allowed in Los Angeles because it is cheaper to use landfills. Los Angeles is experimenting with other ways to dispose of solid wastes, such as compressing wastes for disposal through the city's sewers, and compacting refuse under extreme pressure for disposal at sea. Process modifications and other factors related to regional and economic resources should be considered.

66-0181

Olds, J. From Moscow to Haarlem via Tanzania Compost Science, 7(2):17-18, Autumn 1966.

The national norm today in solid wastes disposal is represented by the archaic crudities of open dumping and open burning and the overloading peak of antique incinerators. In Moscow, the 3,000 tons of garbage dumped daily must be treated by an alternative method. In Haarlem, Netherlands, refuse reducers grind garbage into a material suitable for land reclamation in flooded areas. People in Bogota, Colombia, have poor soil and fertilize with manure. Cesspools are found in Adis Ababa, Ethiopia, and dysentery is prevalent because human waste is used as fertilizer. Privies are used for sewage disposal in Mato Grosso, Brazil, but not enough. Consequently, people use their backyards. In Cholutcia, Honduras, Central America, there are few latrines. Hogs consume waste, which is their main staple Animal wastes are not fertilizers. People in Chunya, Tanzania, use an outdoor lavatory consisting of a hole eight feet with grass around for privacy. Since people in Guatemala, Central America, have few material possessions, they utilize everything and have no waste materials.

66-0182

Onondaga Lake Scientific Council. An environmental assessment of Onondaga Lake and its major contributory streams. Mar. 1966. 60 p.

The 18 member Onondaga Lake Scientific Council of New York, divided into five study sections, each section, with three or four members, proposed specific courses of action in order to purify the waters of Onondaga Lake. It began with an evaluation of surrounding sewage disposal treatment plants, their capacities, efficiencies and the amount of untreated sewage being pumped into the lake as well as the overflows of the major contributing streams in the N.Y. area. The report gave a projected cost analysis for the proposed ten point program based on a 12 to 15 year period. The ultimate aim of the council was to purify the waters on Onondaga Lake to a self-purification level, receptive to fishes; reclaim the surrounding waste-land for recreational areas; control the overflow of its major contributory streams; eliminate offensive odors caused by these over-flows; and eliminate pollution of all surrounding waters to a safe level for human consumption.

66-0183

Orderly dumping of domestic waste. Wasser und Abwasser, 107(12):316, Mar. 25, 1966.

This article is a brief summary of an article appearing in 'Techniques et Sciences Municipales,' Vol. 58, No. 11 entitled 'Orderly dumping of domestic waste.' The geological conditions of the ground selected for dumping are discussed, the establishment and operation of a dumping site, various orderly disposal sites near French cities, and the applicability of waste for agricultural purposes are treated. (Text-German)

66-0184

Packaged waste. Compressed Air, 71(7):21-33, July 1966.

In an attempt to find a solution to solid waste disposal, the Clean Air and Solid Waste Disposal Acts were passed by Congress late in 1965 and the Office of Solid Waste was established. This office has been allocated $20 million over the next three years for research and development of effective methods of waste disposal. Present methods of solid waste disposal, many of which are inadequate, are reviewed. Open dumps, open containers, and inefficient incinerators are not the solution. Sanitary landfills, well-scrubbed containers, incinerators with afterburners, and controlled flow would improve existing conditions. A new, but expensive, approach is underground track systems or waste heat retrieval. Another new method, the Deva Refuse Compression System, which is popular in Europe and has the advantage of working on-site, is described in detail. Refuse of any type can be dropped into a chute which feeds into machines that compress and pack it into disposable paper sacks for collection. Automatic or semi-automatic machines are available for easy installation in existing refuse rooms; both machines are completely air-controlled and operated. Advantages include: reduction of on-site incineration which decreases air pollution; enclosure of refuse in chemically treated sacks which reduces attraction to disease-carrying rodents and insects; ease of handling and elimination of litter; and a reduction in the storage space required and in handling and hauling costs.

66-0185

A policy for the Durham coast. Surveyor and Municipal Engineer, 127(3854):17-20, Apr. 16, 1966.

This article is a reply to a request by the Minister of Housing and Local Government to the local planning authorities for a special study of their coastal areas. The area covered in this report is a 35-mile stretch of the Durham coast, two-thirds of which are occupied with town and village areas, collieries and waste tips which dump 3,800,000 tons of washery waste and pit-stone on the foreshore annually with a planned increase of 500,000 tons this year from quarries, industries, harbor facilities, and holiday use. The undeveloped area which remains is attractive and with a population of 1 million within a day trip. The ruined shore line at Blackhall Rocks with the beach covered with colliery waste is shown in a picture. A map is given which shows the usage of the area by various interests. Another map shows details of the types of pollution and the geology of the area. A table is given which summarizes the County Planning Officer's schedule of areas for improvement. The colliery waste leaves the beaches where it is dumped in terrible shape and also affects beaches farther south. After 10 years of consideration, no agreement has been reached as to a feasible and economically acceptable solution. The County Council believes that the colliery waste should be barged to sea or pulverized to less than 1/50th of an inch for dumping below the low water mark. The coast is a valuable natural resource and, as such, it should be preserved.

66-0186

Preston plans to year 2066. Public Cleansing, 56(12):625-629, Dec. 1966.

The County Borough of Preston, by an unusual example of cooperation between its sewage treatment and disposal manager and its cleansing superintendent, believes that two of its headaches (refuse and sewage disposal) have been cured for the next hundred years. The site of this long-term joint disposal plant is at Clifton Marsh on the north bank of the river Ribble, about seven miles from the estuary, and is over 600 acres in extent. Sewage from a population of 145,000 and domestic wastes from Preston (pop.: 110,000) is processed. The land lies behind a 14 ft flood retaining bank and it is calculated that 40,000 tons of refuse and industrial wastes can be disposed of annually for over 100 years. After a site visit members of the North Western Center discussed some of the technical problems of this plant. Some of the economic aspects were mentioned.

66-0187
Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. 70 p.

The proceedings include ten papers covering the problems of providing adequate community solid waste services in the light of the Solid Waste Disposal Act of 1965. The statute of solid waste disposal in Kansas is characterized and adequate legislation is suggested. Attention is paid to the role of the Federal Government and to the state concerns and responsibilities. The importance of long-range community planning based on competent research and engineering studies is recognized. The problem of solid waste disposal should be approached with the aid properly educated professionals and with local initiative on the part of individual communities, counties, and states.

66-0188
Protective clothing. Public Cleansing, 56(12):607, Dec. 1966.

A summary of an article by J. R. Smith in The National Builder, an organ for the building trades, on all-weather clothing suitable for workers at building sites but presumably applicable to those employed in the disposal of solid wastes, is presented. Garments must have psychological appeal. They should give protection but, if they don't attract the wearer and make him feel like a 20th century technician, they will not be worn. Fastenings and seams are crucial and must be as strong as the garment's material. The weight of the material should be suitable for the kind of work performed by the wearer. Three materials were found to be good: treated cotton drill, polythene-treated nylon (400 thread) and nylon and wool laminated into one material. A design has been prepared and will be tried in these three materials. Danish garments, especially designed for the Danish building industry, were outstanding among those tested.

66-0189
Public Cleansing building for the future. Surveyor and Municipal Engineer, 127(3862): 23-26, June 11, 1966.

The papers presented at the Institute of Public Cleansing conference at Bournemouth on June 7, 1966 are summarized. Efficient street cleaning is impeded by the conglomeration of street lights, pillar boxes, telephone booths, parking meters, sandboxes and litter bins. A need was indicated in refuse disposal plants for the development of mechnical grates for light refuse, equipment for extraction of dust from flue gases, elimination of corrosion in plants, and a reduction in noise. The tipping of crude refuse should be stopped and the public cleansing departments should control all tipping. The value of standard accounts to permit managements to make comparisons was stressed. In comparing external costs, two questions should be asked. Were the figures prepared on the same basis and if they were, why were the results different? The availability of computers emphasizes the importance of standardization of statistics. A photograph is shown of two refuse analyzer units used by the London Boroughs to determine the composition of the London refuse. A survey showed that 28 percent of the present incinerators in London were in need of immediate replacement. In a large section of North London, there was little chance for land reclamation, the incinerators were obsolete, and one large rail transfer point was scheduled to be closed. A table is given of the cost figures of a major refuse incineration plant at Deepham. The annual operating cost is given as £892,095 with a return of £450,000 from electricity, and £100,000 from scrap metal, for a cost of 14/5d per ton for 474,000 tons a year. The estimated cost of the plant is £86,748.

66-0190
Public Works Department. Long range refuse disposal plan. City of Fort Worth. Fort Worth, Texas, Apr. 1966. 62 p.

Refuse disposal requirements through 1980 for the City of Fort Worth, Texas and a plan for economically meeting such requirements are investigated. Refuse disposal is presently handled at three sanitary landfills, two incinerators, and two dump grounds at which burning is practiced to reduce volume of refuse. A table of projected refuse disposal requirements summarizes the anticipated refuse disposal load for the city through the fiscal year 1979 to 1980. The proposed refuse disposal plan provides for phasing out costly and nuisance-ridden incinerators and discontinuance of burning at dump grounds by fully converting to sanitary landfill. The projected total cost for the proposed sanitary landfill plan is $4,730,000 during the ensuing 14 years. The anticipated $880,000 cost for site acquisition and development for the sanitary landfill system can be recovered in operational savings from discontinued use of the City's two existing incinerators. The actions anticipated to be needed in implementation of the long range refuse disposal plan are summarized and chronologically listed.

66-0191
Refuse disposal in the North-east. Public Cleansing, 56(1):6-7, Jan. 1966.

A summary is given of the first report on Regional Considerations in Refuse Disposal prepared by the Technical Sub-Committee of Planning Officers for the Joint Consultative Committee as to Regional Planning, North-Eastern Development Council, dated March 29, 1965. Local authorities reported difficulty in securing sites for refuse disposal. In some areas the problem will be acute in the early 1970's. In addition, high haulage costs force consideration of other methods of disposal such as pulverization plants, incineration, and composting. Refuse volume was found to be increasing as forms of packaging changed, and the weight of refuse per person was reported to be increasing. It was estimated that by 1981 tipping site capacity should exceed 1.8 million cu yd annually for the Tyneside-Wearside area. A basic change of attitude toward refuse disposal was recommended. Refuse should be regarded as a natural resource for environmental upgrading over wide areas and co-ordinated program of positive land reclamation should be developed.

66-0192
Reploh, H., and A. Nehrkorn. Investigations into the significance of fine refuse during waste material processing. Archiv Fuer' Hygiene und Bakteriologie, 150(3, 4):249-259, 1966.

To determine the best method for the disposal of refuse of grain sizes smaller than 10 mm, several filter tests were undertaken. The characteristics and the germ content of the fine refuse before filtering and the chemical composition of the fine refuse after passage through filters of various heights are tabulated. Twenty per cent of the total refuse of a city is fine refuse and examinations revealed that it consists of 25 percent organic components in the winter and 35 percent in the summer. If this refuse is deposited in a thick layer of 1 m or more and exposed to natural rain water, anaerobic decomposition takes place inside these deposits causing poisoning of the groundwaters. The development of hydrogen sulfide gas was also observed. Since incineration caused similar problems, it was concluded tht fine refuse should be disposed of by fine layer composting. (Text-German)

AGRICULTURAL WASTES

66-0193
Agnew, R. W., and R. C. Loehr. Cattle-manure treatment techniques. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. P.81-84.

A combined anaerobic-aerobic lagoon system was experimentally tested and recommended as highly effective. By using this system up to 97 percent of BOD (biochemical oxygen demand) was observed to have been removed, both solid and liquid. Three lagoons are utilized in the system, which are shown to be efficient yet economic to build, especially in the case of cattle feedlots. The effluent from an anaerobic lagoon is potent and must receive further treatment before discharge to a receiving stream. Even after adequate removal of organics, the effluent may pose a problem because of its color and its fertilization capacity.

66-0194
Allred, E. R. Farm-waste management trends in Northern Europe. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St Joseph, Mich., American Society of Agricultural Engineers. p.133-136.

An analysis of the techniques of waste (excrement) disposal in Europe, and the seriousness with which research in this field is carried out, particularly in the various departments of many universities, leads to the conclusion that similar research in this country is relatively undeveloped and the problems associated with waste disposal accordingly less fully explored. In the argument for disposal of the wastes as soil treatment and fertilization material, liquifying methods, holding and mixing tanks, and the results obtained from these various methods are examined with reference to specific installations on farms throughout Europe. It is shown that suitable and economic means are currently in use.

66-0195
Berry, E. C. Requirements for microbial reduction of farm animal wastes. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.56-58.

The conditions at South Dakota manure lagoons are investigated. Low temperatures and overloading are mainly responsible for the failure of a number of the lagoons. Average temperatures of most of the examined lagoons were below 18 C (details are tabulated). Packing of manure solids in the bottom of the lagoon causes an almost completely static condition, permitting the pit to fill with solids. This condition is almost certain to occur when one kind of waste (such as swine manure) is packed into the pit. It has been demonstrated repeatedly with the digester that the seeding of a stalled microbial action will activate the process. The article enumerates micro-organisms involved in manure reduction in general and describes the mechanics of the process. Swine waste-tank study (anaerobic and aerobic) is presented in a chart. In order to reduce farm animal wastes to a state of stability the author recommends equipping the manure lagoons for agitating the material, supplying oxygen, providing sufficient water for dilution to an acceptable level, and increasing the temperature to a degree sufficient for microbial action.

66-0196
Bridgham, D. O., and J. T. Clayton. Trickling filters as a dairy-manure stabilization component. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.66-68.

Three identical trickling filters and final sedimentation tanks were built in the same temperature controlled room (shown in drawings). The volume of each of the filters was about 12.5 cu ft. The medium was spherical granite stones ranging in diameter from 3 to 5 in. The volume of each sedimentation tank was 480 gal. Trickling filters were loaded hydraulically at a rate of 20 million gal per acre per day. Experimental variables, tabulated, were process loading rate (three levels) and ambient temperature (three levels: 45, 55 and 65 F). One 1,800 gal primary sedimentation tank supplied the trickling filters with settled influent. The tank became overloaded after 126 days, when it had received 15,753 lb of dairy manure diluted with tap water to a total volume of 7,731 gal of slurry. The BOD and solids content of the influent and effluents of the three final sedimentation tanks are presented on two graphs. Results show that trickling filters are an effective means of reducing the polluting qualities of dairy manure and a possible means of treating effluent for discharge and recirculation. Experiments suggest a final sedimentation tank volume of about 114 cu ft per cow and a filter system which would require 346 to 391 cu ft of tanks per cow to produce an effluent BOD of 200 ppm.

66-0197
Cassell, E. A., A. F. Warner, and G. B. Jacobs. Dewatering chicken manures by vacuum filtration. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.85-91.

Increasing difficulty is being encountered by poultry farmers in disposing of chicken manure, due to the fact that the surrounding environment of the poultry farms is rapidly changing from open rural areas (where land spreading is feasible) to relatively developed suburban and/or vacation areas (where odor and quantity of manure pose definite restrictions). In an effort to provide evaluation data on the dewatering-vacuum filtration technique of disposing of the manure, experimentation revealed that with the addition of 1.35 percent anionic polyelectrolytes and 0.65

percent cationic polyelectrolytes to precondition the manure sludge, the vacuum filtration process could remove as much as 75 percent of the water from the manure. This would greatly facilitate either incineration or transport and disposal of the remaining solids. Economic analysis of the process was prevented by lack of sufficient data.

66-0198
Cheney, L. T. Farm animal waste problems as viewed by civil engineers. In Management of Farm Animal Wastes; Proceedings; National Symposium On Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St Joseph, Mich., American Society of Agricultural Engineers. p.9.

The fact that all levels of government are stressing the need to clean up our badly polluted waters indicates the problem of water pollution from feedlots will be subjected to ever-increasing pressures for high-quality solutions. The feedlot waste problem presents tremendous challenges to the engineer due to the magnitude of the problem, the characteristics of the wastes, the pollution and nuisance problem, and the economic constraints imposed by the profit potential of the feedlots. To the civil engineer, the problem of obtaining a satisfactory answer is summarized in five steps: (1) development of specialized, large scale factory farms; (2) lack of satisfactory treatment system; (3) management of runoff from feedlots; (4) characteristics of animal wastes; and (5) profit potential and interest of the feedlot operators.

66-0199
Cross, O. E. Removal of moisture from poultry waste by electro-osmosis. Part I. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.91-93.

In an effort to remove moisture from poultry wastes, an experimental application of the electro-osmosis phenomena (proved in civil engineering projects to remove 34 percent of the moisture from soil) was attempted to investigate its applicability to dewatering animal excrement. Three factors were selected as being most critical; amount of electrical current, time, and distance between electrodes. Results showed that a 189 percent drop in moisture content was experienced with the shortest sample (10 cm) and the highest current flow (6 ma per sq cm initial current).

66-0200
Curtis, D. R. Design criteria for anaerobic lagoons for swine manure disposal. In Mangement of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.75-80.

Detailed information is provided for 20 lagoon disposal systems in South Dakota. The lagoons are heavily loaded organically and operate by anaerobic digestion. This process is influenced by environmental factors such as temperature, pH, and available food supply. Successful operation of a lagoon for disposal of manure was evaluated in terms of relatively odor-free operation, trouble-free water-carried manure system, and an economic life of the lagoon system to warrant the initial cost. Lagoon volume provided at time of construction should range from 75 to 100 cu ft per hog, which will allow solids accumulation up to 5 years. A sufficient quantity of water must be available to completely cover the solids and hasten bacterial decomposition. Liquid depth of 5 ft and more appears desirable. Other design criteria include provisions for adequate slope of collection system and discharge conduit to insure trouble-free manure carriage, location of discharge conduit above center of liquid surface, use of a V trough for manure carriage and adequate fencing around lagoon as a safety feature. Physical data on operating lagoons verified by on-site investigation are presented in an appendix.

66-0201
Davis, E. H. Cattle-manure handling and disposal systems on the West Coast. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.45-47.

Disposal of animal wastes as it is being practiced in California, Oregon, and Washington is discussed. Particular attention is paid to manure handling loafing sheds provided with individual stalls, first built in the fall of 1960. Stall housing, however, produces manure which requires special handling. The method of handling and disposing of manure in a sanitary manner depends on climatic conditions and management practices. Disposal of animal waste is part of livestock enterprise and should be charged to this operation. Additional research is required concerning lagoons, nitrate contamination of underground water supplied, grinding units for processing beef and dairy manures, and agitation equipment for large holding tanks. A close working relationship with state health department is essential.

66-0202
Davis, R. V., C. E. Cooley, and A. W. Hadder. Treatment of duck wastes and their effects on water quality. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St Joseph, Mich., American Society of Agricultural Engineers. p.98-105.

Early in 1963 a study was undertaken to determine the effect of coliform organisms in the treated wastes from two duck farms on water quality in an oyster-producing and recreational area of the Rappahannock River near Urbanna, Virginia. Conclusions from this study include the findings that presettling facilities will remove 72 to 96 percent of the coliform organisms per 100 ml. Larger ponds in an alternating pattern to permit cleaning of sludge were very effective. Sampling over the period July 1963 through April 1964 in the stages of the settling ponds and in areas of the adjacent river showed marked improvement in the quality of the water, enabling reopening of the oyster beds.

66-0203
Durham, R. M., et al. Coprophagy and use of animal waste in livestock feeds. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.112-114.

Coprophagy has been observed in cattle consuming limited quantities of all concentrate rations. Investigation of the utilization of varying amounts of manure in feed for laying hens, cattle, sheep, swine, and catfish was undertaken. Favorable results were noted in all instances so long as the amount of manure was limited.

66-0204
Eby, H. J. Evaluating adaptability of pasture grasses to hydroponic culture and their ability to act as chemical filters. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers, p.117-120.

Every year hundreds of thousands of tons of plant nutrients are discharged into the nation's streams and lakes through runoff from farms and from municipal sewage treatment facilities. Financial loss, pollution, and damage to streams, fish, etc., which are the normal results of this waste can be averted by a system of hydroponics to purify the run-off at a relatively low cost. At the same time, hydroponics would provide the plant nutrients always needed on the farm and pollution dangers would be reduced as a result of their removal from water. The effectiveness of the hydroponic system is contingent upon some form of primary treatment either by sewage digestors or in a waste-disposal lagoon.

66-0205
Hart, S. A., J. A. Moore, and W. F. Hale. Pumping manure slurries. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.34-38.

Five pumps, representing centrifugal, positive displacement, and diaphragm types, all commercially available, were tested with water to obtain a better understanding of manure slurry pumping and determine the characteristics of various kinds of pumps. Fresh manure was then mixed with water to form a slurry. Some 300 individual runs were made with these pumps with three manures at various speeds. Individual head-discharge curves were drawn for each run and then combined into families. Almost identical curves were obtained for poultry and swine manures, with allowance for the consistency difference in a fludity comparison diagram. For best results authors advocate a slurry of 1 and 3 (possibly 4) percent for all manures. Among pumps the centrifugals have a greater capacity and cost less as compared with the diaphragm and positive displacement pumps. The latter two types however, were found to be better suited for hard jobs.

66-0206
Hog waste treatment lagoons. Public Works, 97(10):80-82, Oct. 1966.

Field investigations and sampling programs with laboratory analysis of closed system lagoon operations for animal wastes, conducted by the Illinois Department of Public Health, have shown that a confinement installation feeding 1,000 head of hogs had a waste strength equivalent to a town of 3,000 population. (A value of 0.5 lb COD per 150 lb hog was determined.) Cattle feeding operations result in an approximate waste strength value of 1.35 lb COD per animal. Because of the lack of information on treatment systems effective in reducing the organic load of these wastes, Illinois recommends that a non-overflow lagoon be used, designed for not more than 250 hogs per acre of water surface, with an operating depth of 6 ft, or 300 hogs per acre with 7 ft depth. Water level should be kept fairly constant (plus or minus 6 in.) The lagoons should be constructed with 1-1 slope below water line with 3-1 slope embankment above water line (height of banks 2-3 ft). Top width of banks should be 4 to 6 ft. The lagoon must be located in a tight, preferably clay, soil to prevent leakage. Where necessary, the bottom and slopes should be compacted clay, soil cement, plastic lining, or other sealant material. The inlet pipe should extend to near the center of the lagoon and be submerged to provide continuous loading in winter when the surface is frozen. Fencing is recommended.

66-0207
Irgens, R. L., and D. L. Day. Aerobic treatment of swine waste. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.58-60.

An investigation was undertaken to determine whether the aerobic method of decomposing swine waste, which is odorless and results in high degree of stabilization, could be developed into a useful process that would not have the disadvantages of overloaded manure lagoons or be as expensive as an enclosed anaerobic digestor. Some of the factors studied in the laboratory phase were: required dilution, efficiency of oxygen usage, frequency and amount of loading, and characteristics of surplus water and sludge. Measurements of BOD, COD, ammonia, nitrate, phosphate, organic nitrogen, volatile solids, and pH were made before and after the waste was treated. From results of the tests it was calculated that for aerobic stabilization of the waste about 6 cu ft of tank volume per pig would be required and about 1.2 lb oxygen per lb of BOD (0.65 lb BOD per 125 lb pig per day), or 2500 cu ft of air per lb of BOD at 3 percent of oxygen utilization. A laboratory was designed to field-test an oxidation ditch in a swine finishing building (drawing in text), using results obtained.

66-0208
Jones, J. H., and G. S. Taylor. Disposal of household wastes in the soil. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.53-55.

Many septic tank soil absorption systems are malfunctioning due to absorption difficulties. The utility of the systems depends greatly on the size of the absorption field, the waste load, soil conditions and the construction and installation of the absorption field. In addition to the well-known soil percolation test, soil properties such as texture, structure and color, should be considered. Absorption field construction and installation practices should avoid damages to soil such as compaction and smearing. High percentages of failures can be ascribed to clogging of soil during effluent absorption. The use of gravel in soil absorption systems and its role as a filtering and oxidation layer needs further study. Future work should be directed towards, the use of graded filters. An anaerobic environment and sands of high initial hydraulic conductivity aid in avoidance of soil clogging. Effect of effluent and water applications on the conductivity of coarse and fine sands under conditions of ponding are presented in charts.

66-0209
Jordon, H. C. Poultry manure marketing. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.132-133.

A survey of economic means of utilizing poultry manure was undertaken by the Pennsylvania State University between 1961 and 1963, in order to prevent poultry farmers from going bankrupt due to lack of information, or misinformation about the value of dried manure and its fertilization usefulness. It was found to be worth more than 20 dollars per ton on a dry weight basis, specifically in terms of its usefulness and evident marketability as an organic soil conditioner.

66-0210
Kesler, R. P. Economic evaluation of liquid-manure disposal from confinement finishing of hogs. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.122-125.

Manure is a valuable by-product of the hog industry. Economics of the operation may demand that the manure be simply disposed of. A study has been made of the economics of hog-manure disposal, and to evaluate various alternative systems of disposal. The total hauling and spreading method was found to be the lowest in cost, the converse true of the total lagooning disposal process, and a combination of the two ranged between the two in cost. It is concluded that the appropriate method must be determined according to the particular situation of the installation involved.

66-0211
Management of Farm Animal Waste; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. 161 p.

Farm animal waste management is discussed in 45 papers ranging from 'Pumping Manure Slurries' and 'Utilization of Animal Waste as Feed for Ruminants', to 'Design Criteria for Anaerobic Lagoons' and 'Future Research in Animal Wastes'. After a prologue and introduction by various state and federal officials and scientists, the substantive papers are presented in six subject categories (with over half the contributions falling in the first two categories): A. Handling and Disposal of Animal Wastes; B. Treatment of Animal Wastes; C. Utilization of Animal Wastes; D. Economic Aspects of Animal Waste Management; E. European Technology; F. Research Support and Needs. An epilogue, pictorial highlights, list of participants, and appendix of uniform terminology complete the volume.

66-0212
Mehren, G. L. Aesthetics, economics--animal waste. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.4-7.

The animal waste program is presented as an integral and coordinated element within the broader federal-state program of environmental quality. Pollution problems from animal waste, involving more than 2 billion tons of manure dropped annually, are enumerated and the role of the USDA as the guardian of soil, air, and water against needless pollution is stressed. Recommendations of the Report of the Environmental Pollution Panel of the President's Science Advisory Committee as well as of the National Academy of Sciences are analyzed and areas of present and future planned research are delineated.

66-0213
Meland, B. R., and R. W. Boubel. A study of field burning under varying environmental conditions. Journal of the Air Pollution Control Association, 16(9):481-484, Sept. 1966.

The practice of burning 233,000 acres of grass-seed land in the Willamette Valley of Oregon after harvest contributes to a high concentration of pollutants in the atmosphere during August and September. The effect of environmental variables on grass-field burning was studied to determine conditions under which significant air pollution can be obtained. The tests were conducted on 50-ten thousand sq ft plots, half in Common rye grass (a coarse texture with limited regrowth) and half in English rye grass (a fine texture perennial grass). The average and extreme values of the independent variables were given for both grasses in two tables. A graph is given showing the temperatures versus time for locations 2 in. and 1/2 in. below the surface, at the surface and 6 in. above the surface during burning. Two photographs show the plot arrangement and a plot burning. A correlation matrix is given in a table which shows the correlations significant to 5 percent for the variables. It was found that for both grasses the amount of suspended particulates was not dependent upon any of the independent variables such as time from harvest to burning, time of day, air temperature, relative humidity, soil and straw moisture, wind speed and direction, and fuel density. The residue left was dependent upon the soil moisture. Smoke color was dependent on straw moisture. Burning earlier in the season gave less residue, better disease and weed control and reduced the suspended particulate emission at a period when, coincidently, better atmospheric dispersion exists. It is concluded that farmers should be concerned about environmental variables in any effort to achieve their burning objectives with the minimum pollution.

66-0214

Miner, J. R., et al. Cattle feedlot runoff nature and behavior. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.834-847.

In the Midwest, where commercial cattle feeding has increased rapidly, severe water polution problems have developed in waterways. Runoff was measured and sampled from two experimental cattle feedlots. Tray experiments were conducted to study the bacteriological changes in manure lying on the feedlot surface. A series of anaerobic bottle studies were made at varying temperatures to determine changes that take place in runoff water when it is stored in a retention pond prior to treatment. Results show that cattle feedlot runoff was high strength organic waste containing considerable quantities of nitrogen. Runoff from concrete lots was approximately twice as heavily polluted as runoff from nonsurfaced lots. Runoff from both was heavily laden with bacteria normally used to evaluate water quality. The bacterial nature of stored feedlot runoff and litter changed continuously as a function of temperature and storage time. As a result, the fecal coliform:fecal streptococcus ratio does not appear to be an entirely reliable tool to identify the cause of an observed water pollution problem.

66-0215

Miner, J. R., et al. Stormwater runoff from cattle feedlots. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.23-27.

Two experimental cattle feedlots were constructed near the Kansas State University Campus. One was entirely surfaced with concrete; the other had concrete only around feed bunks. East lot was 92 by 24 ft with a constant 2 percent slope. Simulated rainfall was provided at intensities from 0.4 to 2.5 in. per hr. Chemical oxygen demand (COD) was used as the primary parameter of organic pollution. Both COD and biological oxygen demand (BOD) were run on series of 48 samples. A median COD:BOD ratio of 8.8 was obtained. Nitrogenous compounds were measured in four forms: Kjeldahl (total), ammonium, nitrate, and nitrite nitrogen. More organic matter and Kjeldahl nitrogen were found in the runoff with low-intensity rainfall, with moist conditions preceding rainfall, and during warm weather. A detention pond to spread runoff over 24 hr or longer seems feasible. Other recommended measures include diverting all rainfall not falling directly on the feedlot surface around the facility, and maintaining the litter as dry as possible.

66-0216

Moe, P., and S. J. Toth. Agricultural value of linseed meal and hulls. Compost Science, 7 (1):22-25, Spring-Summer 1966.

The agricultural uses for linseed meal and linseed meal hulls as soil additives are investigated. Standard techniques were employed in greenhouse, out-of-door cylinder, and field tests. Total nitrogen content of plant tissue was determined by a modified Kjeldahl procedure and nitrate contents of soils by the phenoldisulfonic acid method. Linseed meal is quite similar to Milorganite in its chemical composition, both containing approximately 6.0 percent or more of total nitrogen, although the linseed meal hulls are considerably lower in total nitrogen (3.4 percent). The nitrogen mineralization and soil aggregating effects of linseed meal products were compared with ammonium sulfate using a Nixon sandy loam as the test soil over a period of 6 weeks. The nitrogen in linseed meal was not converted to nitrates as rapidly as in ammonium sulfate. The data on aggregation indicate a significant increase in water-stable aggregates at each time interval of incubation in soils treated with linseed meal products. In testing the N-availability, ammonium sulfate, linseed meal and Milorganite significantly increased total yields above the control, although linseed meal hulls failed in this respect. Important findings were: the nitrogen contained in linseed meal products is as readily available as the N in ammonium sulfate. However, mineralization rates of linseed hulls is only 50 percent that of meal. The soil aggregating effect of linseed meal products is of relatively short duration. The nitrogen in linseed meal products is more available than that of dried cow manure and other organic nitrogen carriers. Linseed meal products should be applied to soils from the viewpoint of their nitrogen rather than soil aggregating effects.

66-0217

Moore, J. A., and W. C. Fairbank. Maceration for disposal of dead poultry. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.47-49.

Present dead-bird disposal methods include rendering-plant pickup, sanitary fill incineration, disposal pits, and heated septic tanks. All these methods have advantages and limitations discussed by Fairbank in a previous study. However, if the carcasses are ground, chopped, or macerated they can then be handled with the manure in most poultry-manure disposal systems. Reduction to small particle size will accelerate biodegradation and biostabilization processes. Experimentation led to combining the cutting action of hashers and the pulping of hammer mills in a machine which handled the heterogenous material, including feathers found in a chicken. Patterned after a hay bale shredder, the prototype maceration unit used beveled knife sections (3/16 by 3 by 3 in mild steel) bolted onto several 8 in. diameter discs as the basic cutting device. Possible systems for disposal of the macerated poultry tested in the field are slurry spreading, manure disposal lagoon, heated septic tank, artificial composting and thin bed drying.

66-0218

Morris, G. L. Duck-processing waste. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.15-18.

Two Long Island duck processing plants were studied. Composite samples from individual waste water lines were analyzed for COD, BOD, suspended solids, pH, ammonia nitrogen, phosphate etc. Relatively low coliform counts from evisceration waste waters show careful removal of viscera without rupture. Total coliform concentrations ranged from 16,000 to 150,000 per 100 ml. Water consumption in the plants appears rather high compared with chicken processing plants. The total use of water could be lowered by using water from refrigeration units as boiler make-up water and other measures.

66-0219

Morris, W. H. Economics of liquid-manure disposal from confined livestock. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.126-131.

The concept of obtaining the maximum profits from the use of livestock manures is rapidly giving way, in large livestock operations, to the concept of disposing of the manure at a low enough cost and below a certain 'nuisance' level. This type of economics often determines whether the operation can continue at its present location. Where spreading and irrigation cannot be utilized as disposal methods, anaerobic and aerobic lagoon treatment seem to be the most practical for farm use.

66-0220
Morrison, C. S. Farm animal waste problem. In Management of Farm Animal Wastes; Proceedings; National Symposium on Aminal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.8.

The animal waste problem actually has been created by agricultural scientists and engineers themselves, who made it possible to produce animals in total confinement. With automated livestock feeding, the manure piles up faster than the farmer can dispose of it. The problem was recognized in 1958 when the ASAE Rural Waste Disposal Committee X-12 was organized. Its members participated in several conferences, national and international, which are enumerated, where animal waste disposal problems were presented in papers and discussed in committees. Out of this activity an eventual solution to the animal waste management problem will emerge.

66-0221
Morrison, S. R., V. E. Mendel, and T. E. Bond. Sloping floors for beef-cattle feedlots. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.41-43.

The results of three-years' work on sloping floors at the University of California Imperial Valley field station are reported. The object of the 1963 test was to determine the effect of the slope itself on manure movement, cattle behavior, weight gains and feed efficiency. Identical 12 by 14 ft pens with concrete floors were tilted at angles of 1.25, 4.75, and 7.0 degrees from the horizontal, and the results compared with adjacent pens of the same size with a natural (dirt) floor. Tests indicate that slopes up to 7 degrees do not depress weight gains or feed efficiency. A slope of about 5 degrees is sufficient for removal of most of the manure, but unless some flushing arrangement is employed, manure will build up slowly near the feed bunk. Stalls added in 1964 tests seemed to have little value in preventing this build-up. A 6 ft wide slat covered pit installed for the 1965 test series at the lower end of the slope allowed manure to move freely off the floor and served as a satisfactory storage facility for the fluid manure.

66-0222
Neveux, M. Processing and agricultural utilization of urban refuse in France. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.151-152.

The amount of organic matter incorporated into French soils yearly is about 40 to 50 million tons. The annual production of stable manure is about 100 million tons. Little use is made of refuse and sludge for agricultural purposes as compared to stable manure. In the Paris region, 200,000 to 400,000 tons of raw refuse are freed from iron and glass fragments, pulverized, and dispensed immediately to farmers. Transportation costs are high because of the low density of raw refuse. Practical use therefore depends largely on distance between plant and place of consumption. Compost is comparable to good stable manure in quality and is usually much cheaper. The price of stable manure in France is somewhat higher than its true value, whereas the prices of compost and raw refuse are considerably below their true values. Generally speaking, refuse compost is used in agriculture mostly in the south of France, which has a warm, relatively dry climate and where most of the composting plants are also located.

66-0223
Nurnberger, F. V., C. J. Mackson, and J. Davidson. Removal of moisture from poultry waste by electro-osmosis. Part 2. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph Mich., American Society of Agricultural Engineers. p.93-95.

An investigation was undertaken to study the effects of various electrode types and materials on the liquid expelled from chicken excrement by the process of electro-osmosis. A rod type electrode of stainless steel with 20 v d-c (highest current tested) obtained 4.8 percent wb reduction of moisture content on a 22 hr duration; this was not considered sufficient to reach a pelletable level from the initial value of 80 percent wb. The cost of electricity used was calculated to be 12.7 cents per gal of liquid removed (at 2 cents per kw per hr).

66-0224

Osterli, V. P., L. B. McNelly, and B. F. Darley. A progress report relating to the disposal of agricultural wastes in the Bay Area. Riverside, University of California, Agricultural Extension Service and Statewide Air Pollution Research Center, July 1966. 35 p.

This report reviews the accomplishments and adjustments already made by agriculture and allied operations in reducing open burning; points out those management procedures that have limitations or no alternative for adjustment at the present time; reviews the progress of the University of California's air pollution research and education program with special emphasis on more recently developed information; outlines the proposed program for the continuing research and educational effort in developing and applying alternative methods of disposal of agricultural wastes; and presents conclusions which could aid in developing a mutually agreeable adjustment program for both the District and the farmers of the area involved. It was concluded that the total hydrocarbons emitted from burning of agricultural wastes is relatively insignificant when compared to the total hydrocarbons from other sources. Also, agricultural burning is highly seasonal with most of it being done during the period of low oxidant level. Agriculture has adopted alternative methods to open burning for disposal of wastes and will continue to do so as economically feasible methods are developed.

66-0225

Ostrander, C. E. Methods of handling poultry-waste materials. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.32-33.

This paper deals with material primarily from layers housed in high-density systems. This manure is usually not mixed with litter. Each 1,000 layers will produce 4 cu ft or 250 lb per day. It may be collected in pits under wire or slat floors or under cages. In the southern areas of our country, manure can be dried under cages by using open houses, with two birds per cage, good air circulation, and no spillage of water on manure. Where closed housing is used, coning and drying cannot be assured. Stored areas require frequent collection and cleaning. Methods of removing manure from under the birds are by hand, garden tractors, and mechanical cleaners. Deep pits may be cleaned by front end loaders mounted on tractors. Other areas discussed include storing, loading, spreading, processing, and disposal.

66-0226

Production of bio-fertilizer and bio-gas from agricultural waste material. Research and Industry, 11(1):24-25, Jan. 1966.

The rational use of organic wastes is a matter of great urgency in India, where much of the organic waste is burned. A project was started in 1962 in Kanpur to investigate the conversion of leaves, bagasse, and grasses into a methane-rich combustible gas of high calorific value (bio-gas) and a fertilizer (bio-fertilizer). It was shown that 13 to 14 tons of agricultural wastes from the National Sugar Institute's farm and surrounding villages at Kanpur could produce 2,400 cu m of bio-gas having 12,480,000 kilocalories of heat, equivalent to 1,500 liters of kerosene and 25 to 28 tons of moist bio-fertilizers. The first table given shows that bio-fertilizer is superior to other manures, such as farmyard manure, composts and green manure. The bio-fertilizer has a nitrogen content of 1.8 to 2.4 percent, phosphorus pentoxide of 1.0 to 1.2 percent, and potassium oxide of 0.6 percent. Urban compost shows values of 1.0, 1.0, and 1.25 respectively for the same constituents. For farm yard manure, the values are 0.4, 0.2, and 0.4. The results of field trials, using a nitrogen application of 60 lb per acre mds (table) show the yields per acre of grain for a 1.6 percent nitrogen bio-manure to be 38.93 and for straw 72. The values are much higher than the yield from other manures. Only 45 to 50 days are required to produce this bio-fertilizer compared with 6 to 8 months required in compost pits. The system proposed can produce a gas for lighting, heating, and cooking and an excellent fertilizer using units suited to village economy.

66-0227

Quisenberry, J. H., D. D. Malik, and R. Ibarbia. Water metabolism studies may assist with waste disposal. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.49-51.

Water removal from environmentally controlled laying houses and dehydration of droppings below laying cages remain problems of concern to poultrymen. Since 10,000 birds will excrete approximately 5,000 lb of water daily, moisture removal from the laying house assumes a great importance. For many poultry operations, attempts to solve the waste-management problems can best be accomplished by concentrating on methods of obtaining dry or drying the droppings to a manageable level. Three methods have been tested by the authors: use of baffles or splash-boards under cage operations significantly reduced the moisture content of the droppings and the flies hatched therefrom; use of dietary additives such as clays and bentonites shows that as the level of clay in diet was increased, the percentage of water in the droppings decreased; genetic selection for low water excretors. Each of these methods has its merits and should be used by poultrymen as their specific needs require.

66-0228

Reed, C. H. Disposal of poultry manure by plow-furrow-cover method. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.52-53.

The disposal of liquid manure by the plow-furrow-cover technique appears to be an excellent conservation method. The upper soil layer is used as the disposal medium; there is no opportunity for flies to breed or even feed. In a closed handling system there are no detectable odors. With this method from 1 to 2 in. of slurry is deposited in a plowed furrow 6 to 8 in. deep. Immediately after deposition, a single-bottom plow covers the manure, making the next furrow; this can be done in one or two operations. Depositing and completely covering 2 in. of slurry, equivalent to 225 tons per acre, is claimed to be successful. The development of the method, the initial disposal programs, and the proposed experimental program to determine the maximum rate of disposal on a limited land area are described. Several examples of practical application of this method of poultry manure disposal on New Jersey farms are provided.

66-0229

Riley, C. T. Poultry manure disposal--is there a problem? Agriculture, 73(3):110-112, Mar. 1966.

The manure from poultry batteries is heavy, sticky, smells, and is a disposal problem in an age of computers and controlled environment when it is considered cheaper to use artificial fertilizers. This review is based on a survey of 170 farms covering 1½ million layers on 20,500 acres. The problem was not as acute as was anticipated. Imponderable actors such as the smell and the people who smell the smell are as important as the acreage involved and the birds per acre. The average poultry farmer spends a shilling a year per bird to move the manure around and lose it. It costs the farmer with 5,000 birds, with 1,000 gallons of manure output a week, £5 to put this 1,000 gal in a tanker, take it somewhere and dump it. There is a swing away from the hydraulic form of handling toward dry storage in a roofed up-to-date manure pile where the material is kept as dry as possible. Only a few farms are going to use drying or other advanced techniques; most will settle for some compromise, using conventional methods. The value of the poultry manure should influence farmers to reconsider the policy of throwing away their manure and paying the removal cost.

66-0230

Scheltinga, H. M. Biological treatment of animal wastes. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.140-143.

A series of experiments in Holland aimed at investigating the possible methods of low cost animal waste disposal were conducted in an effort to relieve the increasing problem of water (surface) pollution and increasing restrictions put on older methods of disposal due to population density (particularly lagooning). The experiments involved the purification of concentrated dairy wastes by means of an oxidation ditch and were also directed at pig wastes. Under the system evolved, 450 g BOD 5 per cu m seemed to be satisfactorily handled, and the costs were calculated to approximately 75 cents per animal. Earlier results obtained by handling chemical trade wastes with toxic components such as phenol and cyanide in varying influent concentrations were useful in the conduct of the present investigations.

66-0231
Schmisseur, W. E., et al. Materials handling and labor in free-stall and loose housing. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.43-45.

In the winter and spring of 1964-65 Purdue University conducted two 2-month studies in Indiana comparing free-stall to loose housing. The free-stall system required 1/4 ton of straw or 0.8 ton of sawdust per cow per 6 months as compared to 1 ton of straw or 3 tons of sawdust in loose housing. The free-stall system provides each cow with a clean, safe place to lie but there are other management factors--e.g. animal behavior, cow cleanliness, economics, health, materials handling, which have to be considered. Manure handling efficiency favors loose housing; it required 4.6 manhours per cow in loose housing while 5.6 man-hours per cow were needed in free stalls. More manure with less labor and time is handled in loose housing than in free-stalls. An average of 4.5 tons of manure and bedding were handled per cow during winter in loose housing as against only 1.4 in free stalls. Even though the free-stall system offers cleaner cows with less bedding and fewer injury problems; convential equipment, materials handling, and labor requirements favor loose-housing systems.

66-0232
Sobel, A. T., and D. C. Ludington. Destruction of chicken manure by incineration. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.96-98.

Manure handling and disposal present different challenges for poultry and dairy operations; the dairy operations can usually disperse the manure over their feed growing land; no such possibility exists in the future for compact poultry enterprises. An experimental investigation was made into the feasibility of incineration of poultry manure. Combustion is shown as possibly self-supporting, producing enough energy to evaporate moisture at the same time as burning continues, however, future application of incineration will depend on cost factors and possible air pollution hazards, which are not yet thoroughly explored.

66-0233
Sobel, A. T. Physical properties of animal manures association with handling. In Management of Farm Animals Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.27-32.

The following physical properties of chicken and dairy cow manures were investigated: basic physical composition, particle density and bulk density, production, particle size and distribution dilution, settling rate, suspended and dissolved solids, flowability, and freezing point. Significant differences between chicken and dairy cow manures from the point of view of physical properties were noted. Consequently, handling systems which would work for one do not necessarily work for the other. Moisture content of fresh dairy cow manure is 85 percent as against 75 percent in poultry. About 50 percent of the solids for chicken manure are finer than 200 mesh, while only 40 percent of dairy cow manure solids are in this category. At high dilutions the settling rates of chicken and dairy cow manure are comparable, while at low dilutions dairy cow manure settles or compacts slower and is affected more by gas production. In general, the more manure is diluted, the faster settling occurs. However, even though some physical properties may favor using dilution in handling, other considerations such as odor, quantity of material, availability of water and danger of pollution may make this method undesirable.

66-0234
Tietjen, C. Plant response to manure nutrients and processing of organic wastes. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.136-140.

In an effort to find the most economical and profitable means of disposal of animal waste a study is made of the possible improvements that can be made to current waste-management practices. Yield and growth analysis of various types of manures as used with various plants (as fertilizer) showed high yield effect of liquid manures compared with usual barnyard manures, and the influence of various treatments on the properties of the manure. Full guelle (all feces and urine mixed) is described as characterized by a well-balanced ratio of nutrients. The physiological efficiency of guelle nitrogen is found to be several times higher than that of nitrogen in common barnyard manures.

66-0235
Webster, N. W., and J. T. Clayton. Operating characteristics of two aerobic-anaerobic dairy manure treatment systems. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.61-65.

Two aerobic waste-treatment systems, combinations of aeration and settlement, were designed and tested for use in treating dairy manure and to facilitate use of the treated effluent for transporting the fresh waste. The loadings, at first too heavy, were reduced to 0.044 lb of volatile solids per system and rerun. The second test was satisfactory and the loadings and containers were scaled up 100 times, 4.4 lb of volatile solids per system with tank sizes of 1000, 750, 500 and 300 gal. This pilot model was run for 5 months before it was terminated. System A, the anaerobic primary settlement and secondary aeration system was functioning and could have been continued. System B, primary aeration with secondary settlement, did not operate satisfactorily for the full five-month test period. The system selected as best suited for agricultural uses was system A, with the addition of a small secondary settlement tank with provisions for returning the settled solids to the primary settlement tank. This added feature would prevent an anaerobic condition from developing in the final sedimentation tank. Diagrams of experimental treatment systems, an operation chart for the pilot model study, and plots of total solids, volatile solids, 7 pH, and biochemical oxygen demands of the effluent from each tank against time of experiment, are shown.

66-0236
Willrich, T. L. Primary treatment of swine wastes by lagooning. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., America Society of Agricultural Engineers. p.70-74.

There are about 50 hog-manure lagoons in operation in Iowa to date; several of them are, however, malfunctioning because of apparent overloading caused by inadequate lagoon size, intermittent loading one month or more apart, excessive feed waste going into the lagoon, and other causes. In 1963 the Iowa State University undertook experimental anaerobic lagooning in its swine nutrition farm from a 630-head capcity total-confinement hog-finishing building. The lagoon constructed (plan and cross-section shown) for the finishing building had an initial detention time of 67 days, with estimated daily loading rates varying between 3.5 to 5.0 lb of volatile solids per 1,000 cu ft for the past 5 years and manure production values of 0.450 and 0.376 lb of volatile solids per 100 lb hog per day, based on recent 24-hr two composite samplings. Results indicate that this lagoon removed 75 to 80 percent of total solids, 85 to 90 percent of volatile solids and COD, 60-70 percent of BOD and 45 to 50 percent of the total nitrogen. In addition several micro-lagoons were constructed in 1964 to 65 and tested for feeding at various intervals. Recommended design criteria based on these tests are detailed.

66-0237
Wittwer, S. H. Animal waste management. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.7-8.

The gravity of the problem of disposal of animal waste stemming from confinement housing is stressed, using figures of a recent report of the environmental pollution panel of President Johnson's advisory committee. On the local level an example is given of the Michigan State University campus, with its 4,000 acres consisting of experimental plantings, crops, and research facilities and accomodating livestock and poultry, which has a problem in the disposition of 50 tons of manure daily produced by the experimental animals. Hope is expressed that the National Symposium on Animal Waste Management, to be held in East Lansing, Michigan, might come up with recommendations for a vast interdisciplinary program of environmental research on the problems of animal waste disposal.

66-0238
Witzel, S. A., et al. Physical, chemical, and bacteriological properties of farm wastes (bovine animals). In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.10-14.

Many agricultural wastersheds contribute runoff to recreational waters. Runoff containing plant nutrients such as N, P, and K can favor rapid growth of phytoplankton and zooplankton. Also, higher forms of plants become established in shallow waters. Rotting then causes increased oxygen demand. Land receiving manure in winter supplied about 70 percent of phosphorus. An interdisciplinary committee was established to study the pollution sources. The farm animal wastes were characterized by analysis of BOD, COD, N etc. from cattle. Also bacteriological studies of manure were made and the response of plants to manure was investigated. The results showed that a high concentration of bacteria, violatile solids, BOD, and COD are present in waste from bovine animals. Lagoon retention and settling did not generate a safe effluent. Application on the land seems to be the most efficient and practical method of waste disposal. Irrigation, tank wagon, manure spreader, or direct incorporation into the soil can be used. Recent studies seem to favor the use of liquid manure. The design of liquid manure tanks involves the danger of well pollution and other problems.

AUTOMOBILE DISPOSAL

66-0239
Abandoned cars towed by appointment. American City, 81(3):32, Mar. 1966.

On December 1, 1966, a new policy termed 'jalopy-lift' was put into operation in New York City. Motorists with cars they no longer want call the Department of Sanitation office nearest their homes and arrange a mutually convenient date for a special pick-up at the curb. The owner then signs over the vehicle to the Department and the two-truck crew removes it to be auctioned off, if saleable, or to be crushed into a landfill. The new program was initiated because the number of abandoned cars had climbed to 23,386 in 1964. These cars are a traffic and safety hazard as well as detrimental to the clean-city program. The cars become fair game for strippers and by the time the Sanitation Department learns of their whereabouts and its crew comes to remove them, they must often use a heavy crane-equipped truck because the car is no longer fit for towing. This complicates the entire procedure.

66-0240
Billings, C. H. Operation 'big squeeze' takes on refuse disposal. Public Works, 97(1):87-88, Jan. 1966.

The D and J press squeezes old automobiles into a bundle of scrap. The 75-ton monster combines a Cleveland wheel trencher and earth conveyor system, an Arrow tamper, a dozer blade and a four-stage hydraulic press, all mounted on a 59-ft wheel base chassis. A horizontally moving platen presses the load against a shear, which lops off a chunk. Another platen shoves the chunks downward to a third compression stage. The compressed load is extruded in a continuous mass, 36 sq in. in cross section. Meanwhile the trencher wheel has prepared a trench, conveying the dug-up earth to the rear to cover the end of the chute and extruded load. The machine inches forward, lengthening the trench while extruding the load at the bottom of it. Compaction varies between 10 to 1 and 20 to 1. Immediately behind the chute, the tamper is swung into action, oscillating back and forth across the top of the trench to compact the earth without bridging. Average time for the whole process is 3 minutes. The charging hopper is capable of handling 20 cu yd loads. The trencher operates to a depth of 8½ ft with a width of 42 to 44 inches.

66-0241
Bulky refuse and old cars--two growing problems. Surveyor and Municipal Engineer, 128(3877):35-36, Sept. 24, 1966.

In a paper given by H. F. Critchley on refuse collection on Sept. 21 at the APHI conference in Scarborough, the subjects of bulky refuse and the disposal of old cars were discussed. More bulky refuse is being produced by the 'affluent society', with household furniture and fittings being replaced more frequently, although there is little, if any, demand for the second-hand article. These unwanted items are left illegally along the road, in ditches, in fields, and on vacant lots. It is important for the authorities to interpret the term 'household refuse' in a reasonable manner. It is argued that any sort of refuse from the normal occupation of a house, regardless of its size, should be considered as house refuse. Quick action should be taken to clear up dumped materials since such refuse attracts more. Arrangements should be made for the free removal of the bulky refuse. Penalties for illegal dumping should be increased. Of the 250,000 old cars going out of use each year, many of them are being abandoned on highways, in outlying areas, and in vacant lots. The Ministry of Housing and Local Government has ruled that old motor cars be regarded as refuse under the Public Health Act of 1936 and be removed free of charge to the owner. Possibly after a consultation with the scrap metal trade interests, these specialialists could handle the problem with or without the help of the Authority. If not, sites must be made available to which vehicles may be brought by private owners or taken by councils. Possibly the cars could be taken to refuse tips or disposal works to be cut up and returned to industry.

66-0242
Developments in the disposal of old motor vehicles. Surveyor and Municipal Engineer, 127(3860):21-23, May 28, 1966.

The problem facing local authorities in the disposal of old motor vehicles is reviewed in a well-illustrated article and examples are given of controls by use of a compaction unit and with the help of a shredding unit. Illustrations show: a method of loading three derelict cars on a 5-ton general purpose truck; a Proler plant which shreds cars into fist-size lumps with no problems of noise, dust, odor, or effluent; cars and scrap metal being fed to the shredder by conveyor belt; a cactus-grab loading derelicts onto the conveyor belt; a load of derelicts before shredding which would occupy one-fifth the volume after processing; freight cars, each of which holds what was once 100 cars; a pile of the finely chopped scrap being discharged into a pile, and individual segments of the processed scrap. The legal problem of establishing whether a car is really abandoned is explored. Of the various baling presses for old cars the most spectacular is the PSC 376

66-0243
Firm accepts abandoned cars. Waste Trade World, 109(5):5, July 30, 1966.

In the past only one-man scrap concerns have found it profitable to strip, salvage, and clear vehicle carcasses, since where wages were involved, the profitability decreased. Bruce-Laird Ltd. of Edinburgh installed the only machine of its type of the disposal of derelict vehicles in 1965. They are in the process of installing a second press of the same type at their Bonnington premises, to increase the total capacity of their yards. The first plant, which has a capacity of 100 tons a day, guillotines and loosely bales the metal from the carcasses. They have also provided a fleet of articulated vehicles to collect groups of six and seven bodies from collection points. On this mechanical basis they have been able to make the operation profitable. Since the problem of abandoned cars is growing in Scotland, the local authorities reluctantly have accepted some responsibility for their removal. For example, Wick Town Council has authorized the use of a free dump for derelict cars a mile from town to aid in this problem.

66-0244
Getting rid of 'bangers'. Waste Trade World, 108(8):13, Feb. 19, 1966.

If local and municipal authorities want to solve the problem of dealing with abandoned motor vehicles, they must have the cooperation of Britain's scrap industry. The most economical and efficient way of scrapping abandoned cars is by use of giant shears and balers. The three main stages are described: (1) transportation to a centralized dump by a light tow truck; (2) preparation prior to processing, which consists of separating the nonferrous and other deleterious materials from the body shell; and (3) the final processing stage, done by a machine that can take a whole vehicle in one bite. Skilled crews, cranes with mechanical grabs or electromagnets, and mobile-unit transporters to carry the machines are needed. Vehicles transported to local processing plants can be cleared periodically by visits of mobile crushing plants.

66-0245
GLC plans for old cars. Public Cleansing, 56(11):566, Nov. 1966.

The Greater London Council will seek bids from two companies who want to construct pulverizing plants for old motor vehicles, and other large scrap such as washing machines, refrigerators, and stoves. The contractor will be required to collect the material from assembly depots to which the London Boroughs and private individuals will have brought them. About 170,000 cars are scrapped annually in the London area and about 25,000 are disposed of by local government agencies. It is expected that 250,000 cars will be scrapped by 1970.

66-0246
Grant $3 million to put up screens around auto yards. Refuse Removal Journal, 9(1):16, Jan. 1966.

Under the recently passed Highway Beautification Act, $3 million has been allocated to remove or screen off scrapyards and automobile grave-yards that are visible from major United States and state roads. Funds have been granted states in proportion to the number of such operations visible from designated highways. The $3 million will be used for projects along the 41,000 miles of Interstate Highway system and 227,000 miles of other roads constructed with the aid of Federal Funds. However, the Institute of Scrap Iron & Steel has developed a voluntary Green/Screen program in cooperation with the American Society of Landscrap Architects and the American Association of Nurserymen. This program will begin with a number of pilot beautification projects across the country by scrap processing companies, and will not be restricted to the scrap processing yards adjacent to the interstate and primary road systems covered by the legislation. In addition, the Institute has approved the formation of a Scrap Research Foundation to spearhead research on the scrap car problem.

66-0247
The Harris 'Carbasher'. Waste Trade World, 108(21):7, May 21, 1966.

The Harris Carbasher, suitable for operating a Proler plant feeder-service, represents a major breakthrough in preparing car bodies for transport to processing equipment. It is easily transported. The portable skid-mounted unit is moved and operated on a lowboy, while the mobile unit may be towed over the highways, ready for operation. The power unit is self-contained and the optional crane makes either model self-charging. The lid arrangement compresses and shortens a standard car body to 14 ft without concentrating weight in already heavy areas. The finished 'pancake' is 80 in. wide, flat from end to end, and easy to handle and to store. A single operator controls the crushing operation, which can reduce more than 100 car bodies. Twenty or more pancakes can be loaded on a standard 40-ft semitrailer. Rail shipments approach maximum car loads limits.

66-0248
Junked cars rip-rap a pier. American City, 81(9):162, Sept. 1966.

In American Fork, Utah, junked cars are used to stop erosion of breakwaters at the boat harbor. Workmen placed 300 old vehicles against the existing fill pier at Utah Lake, creating a sheltered in-harbor area for the use of boaters, fishermen and water skiers. The cars were stacked and wired together, and heavy rock and gravel fill was poured through the windshields, providing a solid blanket of metal and fill. To complete the project, the entire base was covered with additional fill.

66-0249
Now, shredded cars. Public Cleansing, 56(9):450-451, Sept. 1966.

In the past baling presses and shears have been the chief tools for the processing of scrap. Though the United States has found an answer in the large shredder or crusher, such a plant is not practical in Europe. This Newell plant is the result of research and development. The heart of the plant is the shredder or crusher with the feeding device for cars, the separating systems for non-ferrous material and dirt, deduster and all the interconnecting conveyors. The shredding plants are in three versions--800, 1600, and 3,200 hp and the output in shredded scrap ranges from 10 to 50 tons per hr.

66-0250
One-man operation car-crushing technique. Waste Trade World, 108(18):8, Apr. 30, 1966.

A baling press, fitted with a hydraulic crane and a loading conveyor, has made loading, baling, and ejection a one-man operation, making possible increased productivity and higher profits for car dismantlers. A Vanesco hydro-baling press is used which produces 12 by 12 by 24 in. bundles. The method of operation is described. About 40 prepared shells can be handled during a 7 hr day. Total installation cost is about £36,500. In addition to car bodies the baler can handle other types of light scrap including No. 2 scrap.

66-0251
Public Administration Service. Abandoned autombiles and the disposal of autombile hulks in the Southeast Michigan Six-County Region. Detroit, Metropolitan Fund, Inc., Dec. 1966. 41 p.

A number of recommendations are made with the intention of alleviating the problem of abandoned automobiles in the southeastern Michigan area. The recommendations are tailored to regional needs and legal considerations, and are compatible with a recently announced plan of the Ford Motor Company regarding the processing of automotive scrap. The quantity and characteristics of abandoned automobiles, present Michigan legislation and procedures and experiences in other states are reviewed. Storage of automobile hulks is discussed in relation to hulks held by individuals, hulks held for business purposes, and auto graveyards. Auto scrappage in the Detroit region and the scrap processing industry in general are examined. Research programs and action by local governments toward improvement in the disposal of hulks are considered. A copy of the questionnaire entitled 'Auto Salvage Study Detroit Metropolitan Area' is included.

66-0252
Rising abandoned car volume plagues city. Refuse Removal Journal, 9(3):43, Mar. 1966.

The number of vehicles abandoned on the streets of New York City has increased nearly 9 times from 1960 to 1964. Indications are that this trend will continue. From January through September, 16,500 junked cars were towed from the streets. The growth of the abandoned car problem in New York from 1960 to 1964 is tabulated. The number of abandoned vehicles reached 23,386 in 1964.

COMPOSTING

66-0253
American Public Works Association. Composting. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.279-315.

The history of composting is briefly outlined and the advantages and disadvantages of the process are enumerated. Types of biological decomposition, raw materials, particle size, and moisture and liquid contents of the composted refuse, its aeration, and the function of microorganisms are covered. Costs of processing raw refuse utilizing different compost systems, and data on the production and sale of compost are presented, based on a study of the economics of composting municipal refuse in Europe and Israel. The average cost of processing one ton of raw refuse was $4.55, showing that construction and operating costs in the United States would be considerably higher. None of the plants visited was able to cover its capital service costs and operating expenses through income obtained from salvage and sale of compost. Information on plant design and operation deals with materials handling, grinding, stirring and aerating, temperature and moisture control, and final drying. In reference to the marketing of compost, the effectiveness of long-term contracts and the role of private enterprise in taking care of the retail sale and distribution of compost is stated. The commercial fertilizer companies will probably be the main distributor of compost. Some consideration is also given to on-site composting of kitchen wastes.

66-0254
Battelle Institute to study nitrogen-converting microbes. Compost Science, 7(2):30, Autumn 1966.

The Battelle Memorial Institute is conducting a study through a Public Health Service grant to identify the number and kinds of nitrogen-cycle microorganisms which thrive in compost in order to suggest modifications in solid waste treatment processes which will make the process more efficient and improve compost quality.

66-0255
Brauss, F. W. The hygienic importance of waste composting, especially of the 'Multibacto' composting system. Archiv fuer Hygiene und Bakteriologie, 150(5): 405-412, Sept. 1966.

The natural decomposition of waste to humus consumes much time, space and manpower. To make this method more economical the 'Multibacto' rapid composting system has been introduced. Here the waste, freed from all inorganic material, is crushed and passed to the rotting tower (sometimes mixed with sludge). The waste proceeds slowly from the top of the tower down the eight stories. Stirring arms transport the waste onward. The descending speed of the waste can be regulated by changing the angles of the stirring arms. The access of fresh air is very important in this process. The waste requires 24 hours to pass through the tower and arrives at the lowermost story as compost. Various experiments were conducted. In a bacteriological investigation of the natural conditions in the rotting tower, all tests for the presence of salmonella showed negative results. Thus the waste had to be artificially infected with bacteria, first with the innocuous serratia marcescens *(B. prodigiosum)* and later with salmonella. The various tests are discussed in detail and the results listed in two tables. All tests showed that the bacteria were killed by the heat developed during the process, regardless of whether they were enclosed in ampules or whether the waste itself was infected. It was further found that the bacteria and fungi were considerably reduced in number between the 4th and 6th story whereas the actinomycetes were not reduced in number in their passage through the first 6 stories and increased considerably in the last stories. (Text-German)

66-0256
Brief reports. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.79-81.

Three brief reports are presented. (1) Holland: The Second Compost Plant with Railroad Delivery. The refuse quantity from various cities gradually became too much for the plant at Wijster so that a second plant had to be built. The plant, second largest in Holland, had been provided with railroad delivery so that part of the refuse from the Hague can also be sent there. Plant capacity has been increased to 70,000 tons per year making about 50,000 tons of compost. (2) Germany: Odor Development at the Duisberg-Huckingen Compost Plant. Odors given off when the pile is disturbed are mild in the outer layers, a sour, unpleasant odor at greater depths, and an extraordinarily penetrating putrid odor in the center. The Dano Company developed a process of air circulation combined with a two-stage cooler and water scrubber and installed it in the plant at Duisburg to get rid of the objectional odors. (3) China: Composting of Refuse and Night Soil. The Chinese Government, with WHO help, has constructed in the city of Ping-Tung (Taiwan), an experimental refuse composting plant in which various methods can be tested and compared with one another. It was proposed that the plant be enlarged so that large amounts of night soil from dry privies could be incorporated with it. It has been shown that insanitary treatment and disposal of night soil can lead to spread of disease. But to date in China no method of disposing of such matter in a sanitary manner has yet to be found.

66-0257
The composting game: Mobile loses--Houston takes chance. Refuse Removal Journal, 9(8): 36-38, Aug. 1966.

The city of Houston, Texas, has signed 20-year contracts with three companies which will each build a plant with individual capacity of more than 300 ton per day. As a hedge against the composting venture, a $3 m incinerator will be completed in 1967. At the present time, the plants are costing the city money, since the original bid was $2.75 to $3.50 per ton for disposal, but, in the final contract, the price was increased to $3.47 to $3.51 per ton. Initial offers also added inducements ranging from free compost for city parks to a rebate of 50 percent of the gross profits. However, none of these provisions were in the final contract. The city is also required to furnish and prepare sites for the four plants, pay for bringing roads, water and sewer lines to the location and provide landfill sites for waste rejected by the three companies. It is estimated that about 30 percent of the volume coming into the plants may have to be disposed of either by landfill or salvage. One of the Houston companies reports that it will cost $6.80 per ton to process refuse mixed with sewage sludge. With $3.51 to be paid by the city, this leaves $3.29 per ton that must be made on compost sale and salvage. The operators hope to sell the bulk end product for $5 to $7 per ton. At the present time, marketing plans for the end product are unclear. A citizen's group who objected to the location of a plant in a densely settled residential neighborhood took the matter to court. The court, however, upheld the city.

66-0258
Composting gets rid of garbage. Engineering News-Record, 176(17):46-47, Apr. 28, 1966.

National Waste Conversion Corp. of New York claims it can build a highly efficient commercial composting plant in mid-city to process about 300 tons per day (120,000 pop.) of municipal refuse into a marketable organic fertilizer. The system requires initial removal of only large pieces of building materials, concrete, steel or iron beams, for mechanical reasons. Everything else grinds into a relatively uniform pulp and goes through the composting process to produce the organic fertilizer. Nitrogen, phosphorus, and potassium are added to the refuse during digestion to tailor the final product to the market's needs. The firm installed a 1,000-lb capacity prototype plant last year in Riverdale, New York, with no adverse effects or complaints. Composting involves continuous aerobic digestion of all organic wastes with oxidation accelerated by recirculating partially digested refuse. The process, which is described, is highly automated and uses standard materials handling equipment and instrumentation with system flow similar to that of an aerated sewage treatment plant. Total digestion time varies from 48 to 60 hr for typical urban refuse. The composted product is screened, compressed, granulated, and stored.

66-0259
Composting in Gainesville. Compost Science, 7(1):21, Spring-Summer 1966.

The City Commission of Gainesville, Florida is cooperating in a federal program to build a compost plant for city refuse and refuse from the University of Florida. The city's cost would be $27,500 annually to be paid from fees collected from residents. As part of the agreement, Gainesville will no longer permit open dumping or burning of trash. Two-thirds of the $1 million construction cost and $150,000 annual operating cost would be paid for by the federal government. The Metropolitan Waste Conversion Corp. would pay the other third of the cost. It is believed that the city could save $20,000 per year by the treatment of sewage in the compost plant. The plant, which would be built on land leased by the city, would be turned over to Gainesville after 7 years.

66-0260
Composting: insufficient evidence. Refuse Removal Journal, 9(8):42, Aug. 1966.

All evidence indicates that nobody is willing to pay for compost. The $1.4 million composting plant in Mobile, Alabama, has once again shut down at it is time to ask whether composting, as presented in America, is feasible. To date, the promises and hopes of large-scale composting have not been fulfilled, but, nevertheless, the Public Health Service has now committed close to $2 million for two composting plants, one each in Johnson City, Tennessee, and Gainesville, Florida. Houston is gambling on the success of three composting plants.

66-0261
Composting: is it economically sound? Refuse Removal Journal, 9(7):10-11, 14, July 1966.

Despite considerable investment and technical know-how, no large-scale composting plant in the United States can yet be called a success. Only three very limited installations are in operation today in the United States. They are located in Altoona, Pennsylvania; Largo; Florida, and Boulder, Colorado. Plants are under construction in Houston, Texas and Mobile, Alabama. Four reasons why composting has not been widely practiced in the United States are: (1) a good market for the end product has not yet been found; (2) initial investment and operating costs are generally high compared to other disposal methods; (3) the composition of refuse in the United States has not lent itself to making a high-quality end product; (4) culling out 30 percent or more of the material that comes to a plant--even for salvage--creates a double handling task and means that incineration and/or landfill must still be used. The economic success of a composting plant depends on its ability to market the end product. The reasons why ready markets are not available are discussed at great length. A detailed history of composting in the United States from 1951 to 1965 is also presented and tabulated data show the location, operator, process, capacity per ton per day, and the start of operating compost plants and those which have closed.

66-0262
Composting refuse in a residential area. Surveyor and Municipal Engineer, 128(3886): 23-24, Nov. 26, 1966.

The neighborhood refuse disposal plant which processes 100 tons a day of refuse in a nuisance-free manner in a city park surrounded by a residential area in St. Petersburg, Florida is described. The City pays the International Disposal Corp. which owns and operates the plant, $3.24 per delivered ton of refuse from the 55,000 persons in the surrounding area. The operation of the Westinghouse-built plant involves both manual and automatic removal of salvage and the controlled biological breakdown of the remainder into an organic compost after a 5-day decomposition. The product which contains 1 percent nitrogen, phosphorus, and potash is a clean material acceptable as a natural soil conditioner, and finds a local market as does the salvaged materials. The illustrations show the plant landscaping to blend with the surrounding park, refuse flowing from the magnetic separator, through the pulverator and down to the grinder, a tripper which dumps the compost fron the conveyor into the yard, a front-end loader pushing the refuse into the receiving pit and a schematic drawing of the refuse reclamation system with a detail of the compost finishing system. The key components of the system are the patented grinder which reduces the heterogenous material to a uniform size and the digester which gives the control required for the optimum decomposition into compost. About 10 percent of the incoming tonnage is removed and disposed of directly to the established markets for rags and metals. This is one of the first systems to use all of the refinements of an industrial plant.

66-0263
Compton, C. R., and F. R. Bowerman. Composting operation in Los Angeles County. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.292-298.

The composting of refuse, sewage sludge processing, and grinding rubbish to the sewer is discussed. The final preparation of the composted refuse for sale has not yet been accomplished, but it is planned that the material will be prepared for distribution through nurseries for sale to home gardeners. Various methods of composting were tried. The sanitation districts are currently dewatering digested sludge with centrifuges and stock piling the sludge cake in windrows on open fields for air drying. The districts are anxious to investigate the possible use of composting as a relatively inexpensive and odor free means of decomposing and drying sewage sludge to a marketable level. There is a strong conviction in the feasibility of using large trunk sewers for conveying ground combustible rubbish to sewage treatment plants. A pilot operation will be a full-scale one and should provide basic engineering data relating to the costs of grinding and grit separation, as well as reveal inherent difficulties which may develop in the transportation of the ground material via sewers to the sewage treatment plant. Unless and until major markets are developed for the sale of compost, little likelihood exists that composting will have much utility as a primary disposal procedure.

66-0264
Cosack, J. The reforestation experiment at Zonser Heath. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.56-58.

The biological activity of soils treated with compost was studied in a one kilometer area of the City of Zons. The improvement of the soil was through the addition of screened compost from an old heap and was begun in 1953 to 1954. Amounts of compost ranged from 0 to 75 tons per hectare. A total of 13 test areas was treated with varying amounts of compost. The areas were planted with various lumber trees such as Douglas fir, Scotch pine, spruce, etc. During 1956, additional trial plots were treated with compost with domestic refuse from the Baden-Baden plant. For comparison, plots were also treated with chemical fertilizer. The over-all heights of the trees were measured in the years 1954 to 1957. Comparison charts of tons per hectare vs height of pines are presented. A more general employment of domestic waste composts for reforestation of poor and devastated lands is contemplated.

66-0265
Dutch compost pile shrinks. Refuse Removal Journal, 9(11):20, 21, 34, 36, Nov. 1966.

Hard facts are presented which show why composting is experiencing a sharp decline in Holland. V.A.M., a government agency, has experimented extensively with composting and has continuously experienced large deficits. The cost for composting was found to be $5.12 per ton, while its sale price is only $2.52 per ton. The cost figures on compost production do not include the transportation of the refuse to the railroad loading site, nor do they account for shipping the compost product to its destination, a sum which is part of the sale price. In comparison, the city of Rotterdam has an incineration expense of $2.80 per ton. Reasons given for the decline in composting as a means of refuse disposal include: slowness, odorousness, expense, and abundance of vermin and rodents. The fate of composting in Glasgow, Scotland; Tel Aviv, Israel; Japan; and Kingston, Jamaica, is mentioned briefly.

66-0266
Fairfield Engineering Company. Compost Science, 7(1):4-5, Spring-Summer, 1966.

The Fairfield-Hardy Digester, produced by the Fairfield Engineering Co. has over two years of successful commerical operating experience at the Altoona F.A.M. plant where it was installed in December 1963. The efficient grinding of the refuse by the unique wet pulping process, developed by Altoona F.A.M. continues to be highly successful in preparing the refuse for entry into the Fairfield-Hardy Digester which features continuous flow of material through the Digester. The Digester is automatically controlled and is operated on the aerobic-thermophilic principal of decomposing garbage-refuse and sewage sludge into compost, without objectionable odor. The process includes a receiving hopper with mechanical conveyors which feed the garbage-refuse across picking and salvage conveyors and through a dry grinder into the pulping area where two wet pulpers are used, on an automatic fill and discharge cycle, to pulp the waste material into a slurry. The slurry is dewatered to approximately 55 percent moisture and is then ready to be discharged into the Digester. Three to five days are required for the material to travel through the Digester at an average temperature of 155 F. The material discharged which is sold as an inexpensive mulch, is sanitary, free from pathogens, vegetable and weed seeds, odor, and will not attract insects or rodents. The Digester, which has a capacity of 100 tons per day of pulped garbage and 35 lb per cu ft of sewage sludge, is described. Plant construction costs are estimated at approximately $1,000,000 not including the land.

66-0267
From cabbages to tomatoes. Compost Science, 7(1):2, Spring-Summer, 1966.

The city of Moscow, U.S.S.R. now sends household refuse to dumps. There are plans to erect a 600-ton per day compost plant later in 1966. The plant calls for a 1,500 cu m inlet hopper from which refuse will pass on to a revolving screen, with 20 cm holes. The refuse is crushed after passage under an electromagnetic separator and a non magnetic metallic detector. It proceeds to the fermentation tower or 'hygienisator' where the material is watered, aerated, and mixed for four days. From 600 tons of raw household refuse 350 tons of compost is produced. It is hoped that the compost produced will allow the creation of market gardens in the area of Moscow. Now, Moscow inhabitants eat only cabbage from September to June.

66-0268
Garbage composting. Journal of the Water Pollution Control Federation, 38(5):733-73, May 1966.

The present status of garbage composting is presented in a group of short abstracts of 38 articles selected from the international technical literature. Composting of garbage may become the method of the future for the disposal of municipal refuse. The Tennessee Valley Authority and the Public Health Service have proposed a 'Solid Wastes Composting Research and Demonstration Project' in which a full-composting plant would process all of the organic wastes from the Johnson City, Tennessee, collection system and all of the sludge from the sewage plant. St. Petersburg, Florida, has a 105 tons a day composting plant with an estimated cost of $3.29 per ton. Houston, Texas, has plans for three composting plants which, in conjunction with an 800-ton incinerator, will process 2,400 tons of garbage. A pilot plant for processing 50 tons per week of restaurant garbage in Brooklyn uses a 10-ton digester. At a Solid Waste Seminar at Tufts University, one of a number being held throughout the country, it was pointed out that present solid waste disposal methods in the Boston area are using up from 78 to 260 acres a year. Reviews are presented of composting in Britain, Italy, and France. Investigations on oxygen and carbon dioxide content of decomposing material, optimum moisture conditions, and the fate of pathogenic organisms added prior to the composting process, are mentioned. A 38-item bibliography is included.

66-0269
'Guinea pig' editorial from the Houston Post. Refuse Removal Journal, 9(8):37, Aug. 1966.

Houston has a plan for composting that involves the building of two plants that will each take 300 tons of garbage a day. They should be operating this summer or fall. Since smaller plants in smaller cities have failed, Houston is in effect experimenting. Curiously, the City Council advocates composting, saying it will not cost the city anything even if it flops, but has spent almost $200,000 for one plant site. During the negotiating for composting contracts, the Council approved an increase in costs as much as $0.75 per ton. Furthermore, Dr. Melnick has warned the City Council is risking the lives of neighborhood children by placing one plant next to a sewage plant.

66-0270
Haulers resist disposal charges at composting plant. Refuse Removal Journal, 9(9):8-9, 37, Sept. 1966.

To sustain the sinking operation of the Colorado Compost Co., the City of Boulder, Colorado, passed an ordinance making it mandatory to take all city-originated refuse to the compost plant. The Colorado Composting Co. opened a plant in late 1965. It is a 100 ton per day grinding and windrowing operation that was originally to charge Boulder $2.60 to $2.75 per ton, and private contractors would pay $0.60 per cu yd. The County of Boulder would get a refund of 3 percent of gross profits. For most private contractors—who handle all residential and commercial collection in the city and county—this meant an increase in dumping fees from $0.20-$0.35 per yd to $0.60. The contractors challenged the ordinance in court. A colorado court rules that the City of Boulder exceeded its territorial jurisdiction by designating an out-of-city disposal site. The decision may be appealed, but contractors no longer must transport refuse to the Colorado Compost Co.'s plant, 3. miles from the city. Reasons for the economic difficulties of the composting plant are that marketing goals have not been fulfilled and the firms equipment is not functioning well.

66-0271
Kupchik, G. J. The economics of composting municipal refuse, Public Works, 97(9):127-128, Sept. 1966.

Cost and income data were collected from 14 composting plants in Europe and Israel. These plants employed either the Dano Biostabilizer (refuse retained three to five days in a slowly rotating drum); Dorr-Oliver Rasp (windrow three to five months after sorting, grinding and crushing); Ventilated Cell (in cells with forced or natural ventilation); Buhler-Dano combination (no sorting, grinds in rapidly rotating hammermill); or Van Maanen (refuse is wetted and decomposed in large windrows for four to six months, then processed by screening, grinding). Average cost was capital service—$1.76 and operating expenses, $2.79 per ton of raw refuse. Weight of compost produced was 46 percent of raw refuse processed. Average income from sales was $2.73 per ton of compost or 90 cent per ton of raw refuse. Additional income from salvage materials averaged 20 cent per ton of raw refuse. No plant visited could cover costs and expenses through income obtained, from sale of salvages and compost. Deficits ranged from 32 cent to $5.32 per ton of refuse processed. Pulverization appears to hold promise as a pre-treatment to reduce substantially the volume and alter the character of refuse, prior to either landfill, incineration or composting operations. Costs would be higher in the United States.

66-0272
Kupchik, G. J. Economics of composting municipal refuse in Europe and Israel, with special reference to possibilities in the USA. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 92(SA6):41-56, Dec. 1966.

The most common composting processes are reviewed briefly: Van Maanen process, rasping system, ventilated cell composting, the Dano system, and the Buhler system. An economic survey of 21 composting plants in ten countries is described; six plants (Rome, Haifa, Cladsaxe, Soest-Baarn, Cagnes-sur-Mer, and Edinburgh) use a combination Buhler-Dano system (using a hammermill in addition to the Biostabilizer). Five other use variations of the ventilated cell system (Plaisir, Annecy, Soissons, Bristol, and Cheadle) and one (Wijster) uses the Van Maanen process. Data is tabulated but does not included data from Czechoslovakia (uses Vitahum process) or Vienna. Data surveyed include: costs for amortization, interest, reserve fund, land rental figures, personnel, utilities, maintenance and repairs, and disposal of rejects; and income from salvage and compost production and sales. The plant with the lowest unit costs ($2.27 per ton raw refuse) was a Dorr-Oliver plant, which is also probably th largest working plant in the world, process almost 200,000 tons of raw refuse a year. Income from salvage and sale of compost, as well as a government subsidy, however, does not wipe out an operating deficit in this plant. Average capital service costs of 14 plants are $1.76 per ton, operating expenses average $2.79, for a total cost of $4.55 per ton of raw refuse processed. Income from salvage and sale of compost averages $1.17. The single most costly item was personnel ($1.23) followed by amortization ($0.95). Costs in the Dano and Dorr-Oliver plants are remarkably similar, and ventilated cell systems are higher. The applicability of these data to the United States is discussed Substantial prices for compost were obtainable practically only in Israel. Pulverization appears to hold promise as a pretreatment in order to reduce volume and alter the character of the refuse.

66-0273
Marketing the end product. Refuse Removal Journal, 9(7):11, July 1966.

The problem of how to sell and use the end product of composting is discussed. Several questions are asked: Who will use compost, and why? What products will it replace? What is the market volume? How much will the consumer be willing to pay? If compost is to be used on farms, local conditions, habits and practices are the key factors to consider. Developers of composting plans tend to generalized about the use of compost instead of studying the local marketing potential. While the organic matter of compost is of chief interest for farming, the trend in American refuse is for a reduction in the proportion of organic food wastes in municipal refuse. Furthermore, favorable sales of compost from a small operation does not mean similar success will follow for a larger facility.

66-0274
Maystre, U. Must bad odors always accompany a composting plant? Compost Science, 6(3): 13, Autumn-Winter 1966.

The composting plant at Villette (Geneva, Switzerland), located near a residential area, has been in operation four years. It processes the waste from 8 municipalities with a total of 28,000 inhabitants, and the sludge, dehydrated to a 55 percent water content, from a biological sewage purification plant built next to the composting plant and processing the sewage from 20,000 inhabitants. Although initially it was hoped to store the compost produced in agricultural areas, to avoid complaints of noxious odors, faulty operations at the start forced management to find quickly a way of stopping the production of fermentation gases. The solution was to collect the fermentation gases as they are produced throughout the plant and blow them into buried pipes. The soil acts as a filter. Sand is better than clay, and humidity affects efficiency. Results have been satisfactory and thus far there have been no complaints. The results were obtained with Dano equipment, but the method would be applicable to other systems. Neither incineration nor composting can satisfy all demands; multi-purpose plants are needed to serve large towns.

66-0275

Metropolitan waste conversion corp.
Compost Science, 7(1):6-7, Spring-Summer, 1966.

The Metropolitan Waste Conversion Corp. has a demonstration plant near Largo, Florida which incorporates a completely integrated disposal system by composting, including adequate sorting facilities, paper and rag baling, magnetic separators, sewage sludge storing, handling and mixing, mechanical rapid digestion system, with automatic mechanical feeding and discharging with all requirements of moisture, temperature and air controls. After the regulated digestion of 6 days, the finishing facilities which consist of re-grinding, screening, grading, bulk storage, automatic bagging facilities, and outloading prepare a uniformly textured compost for marketing. The concept of live bottom hoppers is utilized, which not only serve as storage bins, but move material at a controlled rate of delivery to the conveyor system where measured quantities of material are moved to a sorting section featuring hand sorters. Grinding components consisting of hammermill type grinders have certain features which make the material flow easily through chutes and hoppers. An accelerated, completely aerobic-type digester is used which is basically low in per-ton-capacity, cost, yet simple and highly effective in operation. The actual and total cost of garbage disposal is dependent upon the location as it affects hauling distance by collection units, capital cost of the unit, labor and maintenance required to operate the unit and other cost factors.

66-0276

Mucke. The compost can - a contribution to the solution of the waste problem.
Stadtehygiene, 17(6):135-137, June 1966.

The compost can which converts garbage from the kitchen and garden, and waste paper into compost provides not only the gardener with valuable mulch, but, if used in the city, could also produce mulch on a large scale for agriculture. The can is emptied every 3 to 4 weeks. The mulch ripens in about another 5 weeks. Spread about 5 cm deep on flower beds, it helps to keep the soil loose and to prevent weeds. Positive reviews from several journals are quoted. Contrary to widespread belief, paper does rot and becomes a good mulch. The price of the can (120 DM) is rather high and should be reduced by mass production and by subsidies from the communities which have less trash to collect. The fact that only putrescible trash should be put into the compost can requires cooperation of the users. This will probably make the introduction of the compost can on a large scale difficult, but it could be overcome by an advertising campaign. (Text-German)

66-0277

Municipal Sanitation Office. The new compost plant at Duisburg-Huckingen in operation. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.78-79.

A brief history of the compost plant is given. Laden refuse trucks dump into receiving bunkers. Raw refuse is transported by conveyor to the composting plant. Scrap iron is sorted by magnetic pulleys and baled. On the final sorting conveyors, valuable and brittle materials are picked by hand. The refuse is then conveyed to rotating drums (biostabilizers) and mixed with sludge. Biological decompostion starts with forced aeration and continuous rotation of the drums, converting the refuse-sludge mixture to raw compost in four to five days. After leaving the drums, the compost is freed of glass, stones, rags, and otherwise useless substances by screening. The compost is then immediately given up to agriculture or is piled temporarily in heaps. Screen residues are dumped. Data is furnished.

66-0278
New compost plant for Moscow. Public Cleansing, 56(11):584, Nov. 1966.

The Triga Company of Paris has signed a contract for a 600 ton per day refuse treatment plant in Moscow which should be in operation by the end of 1968. Refuse will be delivered into a 1,500 cu m hopper, conveyed to a screen with 20 cm holes, then through an electromagnetic separator, a non-magnetic metallic detector, and then through Hazemag pulverizers for crushing. The ground refuse is watered, aerated and mixed for four days. From the 600 tons of household refuse received daily, it is expected that 15 tons of metal will be recovered and 350 tons of compost. Under normal working conditions three persons will operate the plant: one superintendent, one assistant, and one laborer.

66-0279
A new composting process for refuse and sludge-the Tollemache system. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, Public Health Service, 1966. p.234-235.

The Tollemache process, as developed at the refuse composting plant at Mabelreign (Southern Rhodesia), is described and illustrated. Refuse passes on a conveyor from bunker to a screen and magnetic separator plus hand sorting, then to a ballistic separator to remove glass and rocks. After the addition of water or sludge, the material is discharged into composting chambers. The refuse is mixed and pulverized by a travelling turner-mixer at the chambers. This procedure is repeated until the compost leaves the chambers which is two weeks. The cost is about $2.10 per ton of compost for a plant with a capacity of 40 tons per day.

66-0280
Obrist, W. Additives and the windrow composting of ground household refuse. Compost Science, 6(3):27-29, Autumn-Winter, 1966.

The addition of various microorganisms is often suggested to speed up the composting of ground household refuse. Experiments were conducted in plastic bags containing specified contents with additives consisting of: (1) Earp-Thomas bacterial starter; (2) spore suspension (Thermomyces lanuginosus); (3) refuse compost from 20 cm below the surface, 50 C, and heavily mildewed. These additives proved to be practically useless in a situation where decompostive is relatively long. In a plant where the fastest possible composting is desired, the addition of nutrients or microorganisms could be of importance, but data about this are insufficient.

66-0281
Pacheco, J. ''Manufacturing'' compost from urban refuse in Spain. Compost Science, 7(2): 31-32, Autumn 1966.

This article mentions various composting plants in Spain and their capacity. No special equipment or processes are discussed.

66-0282
Peyer, E. Erosion prevention with compost in viniculture. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.194-196.

Two experiments were performed to observe erosion damage in viniculture using urban compost. Fifty cu m were spread over 24.3 acres at the Leutschen experiment. Two heavy deluges were recorded at this site during the summer of 1959 causing heavy damage in part of the vineyards. The plot treated with compost, showed no evidence of erosion in contrast to earlier experiences. The quality of the soil was improved. Crust formation did not appear at the surface of the plot. Similar observations were made at the Sternenhalde experiments. During summer storms, which caused severe damage to other plots, no erosion pits or gullies appeared on the treated surfaces. No fine soil was evident, in contrast to the untreated slopes. Sufficient compost must be applied, however, because erosion damage was observed after an application of only 2 kg per sq m in another plot.

66-0283
PHS grants $250,000 for Florida compost study. Compost Science, 7(2):25, Autumn 1966.

The Metropolitan Waste Conversion Corporation of Wheaton, Illinois, will build and operate a 130 ton per day compost plant in Gainesville, Florida. It will cost $1,100,000, and the U.S. Public Health Service is giving a $250,000 grant. The objective of the project is to study health, safety, reliability and economic feasibility of using composting plants in communities of 50,000 to 100,000 people. The plant will assimilate large proportions of raw sewage solids, blended into raw ground garbage, and then compost the mixture.

66-0284
Popel, F. Recent developments in the technique of refuse processing. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.135-137.

Two accepted methods of treating urban refuse are incineration and composting. Hygienic requirement are completely satisfied by burning municipal liquid and solid wastes. Composting of liquid and solid wastes also fills the hygienic requirements. Composting processes for refuse and refuse-sludge in common use today are summarized and presented. For composting with refuse, sewage sludge has to be dewatered; it can first be air-dried on beds and then piled for composting using the heat produced for drying to a solid content of 80 to 90 percent. Joint composting offers the following advantages: the aerobic thermophilic composting transforms the sludge to meet hygienic requirements? the quality of compost is improved by addition of sludge; sludge addition intensifies the composting by innoculation with microorganisms; reduction of C/N as a result of the high N content of sludge, and by moistening the refuse which alone is dry.

66-0285
Project to study composting of refuse with sewage sludge. Public Works. 97(4):130, Apr. 1966.

The P.H.S. Office of Solid Wastes will be responsible for technical direction and financing of the Johnson City composting plant which will cost $750,000 to build and $100,000 per year to operate. The project is a study of composting as a means of safely and economically disposing of municipal refuse and raw sewage sludge. The compost will be used experimentally to condition poor soil.

66-0286
Refuse and raw sludge composting. APWA Reporter, 33(3):5, Mar. 1966.

With a $375,000 grant from the Office of Solid Wastes, the Tennessee Valley Authority will design, construct and operate a composting plant at Johnson City to process 60 tons daily of refuse and untreated sewage sludge. The plant will cost $750,000 to construct and $100,000 annually to operate. The Economic Development Administration will provide $35,000 to determine the feasibility of an area-wide sewerage system in Jefferson County, West Virginia.

66-0287
Reidel, E. O. The refuse typhoon, a mobile processing plant. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, Public Health Service, 1966. p.122-123.

A mobile unit, called a refuse ''typhoon'' provides for: magnetic separation, sieving to remove ashes and powdery wastes, and grinding. The versatile typhoon is intended for small and medium-sized communities. It provides for iron removal, grinding, and windrowing for composting. A smaller unit will process five to six tons per hr and costs only 80,000 German marks. Operating costs of this machine are considerably less than one-third of the larger so that a sale price for the compost of only four marks per ton need to realized. No plant building is needed for the refuse typhoon. The normal capacity of the refuse typhoon is 12 to 15 metric tons of refuse per hr. Cost breakdown of the machine and expenditures of a typical operation are charted and furnished. A parts list is also furnished.

66-0288
Reimer, L. G. Refuse reclamation - a solution to a growing urban problem. Westinghouse Engineer, 26(6):175-7, Nov. 1966.

A close to ideal way of disposing of a city's trash in a fast, inoffensive, silent, economical, and invisible manner is discussed in a description of St. Petersburg, Florida's new refuse reclamation plant which is located in a park in a residential neighborhood. The disposal consists of salvaging marketable items such as metal and rags and then converting the rest of the refuse into a soil conditioning compost. Smoke is avoided since there is no incineration and flies and rodents are excluded by complete enclosure. The highly mechanized composting process, which takes five days, produces no offensive odors. The location of the plant in the city cuts hauling costs and a photograph of the reclamation plant shows it landscaped to blend into the residential neighborhood park. Another picture shows the compost being conveyed from the digester after controlled bacterial action has converted ground refuse into compost which will be sold partly in bulk and partly by the bag. A schematic flowsheet shows the trash and garbage passing the salvage station, the magnetic separator and the pulverizing and grinding operation before being composted for five days in the digester. Any compost which is too coarse to pass the screens is recycled. The final compost product has less than 20 percent of the volume and more than 80 percent of the weight of the incoming refuse. The city pays the operator of the plant $3.24 a ton for 31,200 tons disposed of annually.

66-0289
Riad, A. Composting activities in Cairo, Egypt. Compost Science, 6(3):29, Autumn-Winter 1966.

In 1928, the Beccani Company applied for the monopoly of treating Cairo's refuse. An Egyptian company was formed in 1947, after the Boggiano Pico process was adopted, and given the monopoly of changing all municipal refuse and slaughter house waste into organic fertilizers or subsidiary industrial products. A plant built to treat about one-third of the refuse was in operation in 1951 and failed. The guaranteed daily output of 300 tons of fertilizer was never reached-in fact, it never exceeded 80. Municipal refuse now is about 2,000 tons per day, and the government is again considering which of the 30 or so processes are best. A group of experts are visiting installations to choose the process best suited not only for Cairo but for the entire country. Windrowing has been in use for the last 25 years in many small towns and villages to convert their refuse to organic fertilizer.

66-0290
Richland Company. Compost Science, 7(1):8, Spring-Summer 1966.

The ''Richloam Rapid Composting Process'' has been utilized in a Boulder County, Colorado plant since May, 1965. The president of the Rich-Land Co. is pleased with the results of the plant which handles most of the municipal refuse from the city of Boulder. The central receiving hopper for incoming refuse is wire-mesh enclosed to eliminate windblown papers. The refuse is carried by a belt conveyor from the hopper through a completely covered area where salvage and sorting operations remove metals, glass, etc. It continues by conveyor to a giant 200-hp pregrinder before being transferred to a windrow area for processing. Composting is accomplished in a series of windrows, the process being accelerated by the use of the Richloam Rapid Composter which travels, through the windrows, shredding, aereating, and moistening the material in a single operation. High temperatures destroy the fly larvae and pupae as well as weed and seeds and pathogenic organisms. Land requirements are 3 to 5 acres. Processing time is 14 days plus 3 to 4 weeks to cure in bins.

66-0291
Roller, J. and M. Cointat. The sale of composts from household wastes, or urban wastes obtained from household wastes. Techniques et Sciences Municipales, 61(334-337):Aug.-Sept. 1966.

The nomenclature of household refuse is discussed in this circular from the Minister of Agriculture to the Division Inspectors of the Suppression of Frauds, to the Heads of Departmental Services of the Inspector of the Suppression of Frauds, and to the Directors of laboratories associated with the Suppression of Frauds. It is important that unprocessed, partly processed, and processed refuse is not sold by the wrong description and that the consumer is clearly informed of the different categories of these products. Such products on the market are classed into four categories: green refuse; screened, pulverized refuse; urban composts, or composts from household refuse; and screened material from dumping. In two appendices two methods are described (Pale and Kjeldahl) for determining the carbon and nitrogen contents, respectively, of urban composts. (Text-French)

66-0292
Tenaille, G. Moscow to build 600-ton-day compost plant. Compost Science, 7(1):17-18, Spring-Summer 1966.

The Triga Company of Paris has constructed three composting plants in France equipped with Hazemag crushers and fermentation towers. A contract has been signed for a 600 ton per day plant in Moscow which will be the largest composting plant in the world. This plant will be equipped with Hazemag crushers. With the increased percentage of incinerated refuse, the incineration capacity of the furnaces will be 150 tons per day. The composting plant in Plaisir, France is also described. The gathering trucks discharge their load into and inlet hopper, the bottom of which has a conveyor provided with a metal apron. If refuse contains non-magnetic metallic parts, these are detected by a high frequency device. The non-metallic refuse mass is then discharged by the belt conveyor into a hammer crusher composed of two rotors, fitted with radial hammers, rotating at high speed, one against the other. The crushed residues are taken again under the crusher, by a vibrating conveyor which dishcarges them into the bucket chain elevator which transports them to the fermentation tower. The fermentation tower, so-called ''hygienisator'' is a vertical cylinder of reinforced steel sheet, divided into four sectoral compartments. Advantages of the process include elimination of hand sorting, total suppression of dumps, ease of operation, accelerated processing with reduced required surface of the ground plot, and production of first grade compost.

66-0293
Wiley, J. S., F. E. Gartrell, and H. G. Smith. Concept and design of the Joint U.S. Public Health Service - Tennessee Valley Authority Composting Project, Johnson City, Tennessee. Compost Science, 7(2):11-14, Autumn 1966.

The Tennessee Valley Authority and the Public Health Service agreed in Aug., 1964 to undertake a joint research and demonstration project on solid waste composting. Johnson City, Tennessee, was selected as the preferred site for the proposed plant and it agreed to join PHS and TVA in the project. The proposed plant will be of the windrow type capable of treating all mixed refuse and raw sewage sludge from the city of 33,000 population. Certain commercial and industrial organic wastes also may be treated. The plant is designed to operate 5.5 day per week, with a capacity to process 58.5 ton per day of mixed refuse with a maximum of 70 ton per day and sludge quantities of 9,100 to 13,200 gal per day or 3,800 to 5,500 lb per day or dry sludge solids. Refuse processing equipment is designed to handle 10 ton per hr. Flow diagram and related equipment is presented. The estimated average daily production is about 25 tons of 42 percent of the weight on incoming refuse. One of the objectives of the project is to study the economics of the process. Complete construction and operating cost date will be obtained and economic evaluation of the process will be made. Routine analyses will be made on samples of raw wastes and compost for total solids; certain chemical tests, mainly for nitrogen, phosphate, and potash will be performed to assess the nutrient value of their compost; and to detect and permit the correction of any health or safety hazards or nuisance conditions, close observations of odors, dust, noise, flies, and rodents will be made throughout the plant. The demonstration composting plant operation is scheduled to continue through fiscal year 1972. (Presented at Fifth Annual Sanitary and Water Resources Engineering Conference, Nashville, Tennessee, June 3, 1966)

66-0294
Wiley, J. S. A discussion of composting of refuse with sewage sludge. In APWA Yearbook, 1966. Chicago, American Public Works Association. p.198-208.

Addition of sewage sludge to refuse for composting quickens decomposition and improves the quality of finished compost by increasing the nutrient content. Sludge can replace water in adjusting moisture content. The quantity of sludge to be disposed is constantly increasing, and digestion and treatment is expensive When sludge is utilized for composting, conventional sludge digestion and drying could be eliminated, and replaced by raw sludge thickening and pumping to composting plants. For a slight increase in refuse composting costs, a considerable savings in sewage treatment costs can be realized.

66-0295
Wilson, N. G. The refuse composting plant in Edinburgh. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.93-94.

Edinburg's chief problem was to find a substitute for the incinerators for which construction and operation costs are very high. Besides it was idealogically desirable to return the organic refuse to the soil. An experimental compost plant was built using the Dano biostabilizer method. An analysis of the compost made from the process is given. Demand for the refuse is large, particularly in agriculture, truck gardening, and by private garden owners. The selling price is about $4.90 per ton. Other biostablizer plants are planned, one of which will have an operating capacity of 290 cu yd. Financial savings from such a plant, considering yearly loan and interest charges as well as reduction in payroll, reveal a considerable economic advantage compared to the usual incinerator, even if the compost has to be distributed free of cost.

66-0296
Wolfskehl, O., and E. Boye. Answer to Mr. Klotter's rebuttal. Schweizerische Bauzeitung, 84(19):359, May 12, 1966.

As far as the testing method is concerned, Mr. Klotter's opinion (concerning the effects of ash and of composted waste on groundwater) cannot be accepted. Since every substance shows a different solubility it is necessary to show the magnitude of solubility quantitatively. Mere qualitative considerations by necessity lead to fallacies. The factor of variabilities of soil types was taken into account in that we chose an especially frequent case, namely that of increase carbon dioxide content. Obviously any kind of water penetration into the ground is to be avoided if possible. Despite precautions, however, it is very likely that enough water will accumulate, carrying dissolved substances with it into the ground. The slag used in the experiment came from a regular waste incinerator plant and was not especially selected for the experiments. (Text-German)

66-0297
Wofskehl, O., and E. Boye. Effects of dumped ash and of composted waste on groundwater. Wasserund Abwasser, 107(2):36-38, Jan. 14, 1966.

According to an article by A. Andres (Kommunalwirtschaft 4(4), p. 145, 1964), composted waste can be deposited everywhere without having to fear a spoilage of the groundwater, contrary to the deposition of the ash residues from waste incineration. In reality, however, quite the opposite is true. In the composted waste the salts are not bound by organic substances; they are either absorbed or occluded. Thus they can be easily washed out by water. During incineration, however, which takes place at temperatures of more than 800 C in the presence of oxygen, the salts amalgamate with silicic acid and form a vitreous substance insoluble in water. Several experiments were carried out to prove this point, using extraction with distilled water or water saturated with carbon dioxide. The results were tabulated and compared with maximum allowable concentrations of various anions and cations in drinking water. The decomposition of composted waste, not as fertilizer but on disposal sites, is indeed much more dangerous to the groundwater than the dumping of ash residues, since much greater amounts of nitrates and sulfates, in particular, are washed out. The water solubility of chromium hydroxide prepared at various temperatures was experimentally investigated. The findings were plotted in a diagram which shows a maximum of 9 percent solubility of Cr at 300 C. In general, the higher the temperature of incineration used, the more vitreous, insoluble substances--harmless to the groundwater--are produced. (Text-German)

66-0298
Zambetti, T. The refuse treatment plant of the Baden-Brugg region. In International Research Group of Refuse Disposal (IRGRD), Information Bulletins 1-12. Washington, U.S. Department of Health, Education, and Welfare, 1966. p.263-265.

Ten communities in the Baden-Brugg region joined efforts in constructing a composting plant using the SMG/Multibacto process. The refuse is first gound, iron and tin cans removed by a magnetic pully and baled and then sieved. The fine refuse is inoculated with a special bacterial mixture and mixed with water or later, with sludge. It then goes to a digester, where material is constantly mixed, rotated and aerated automatically. By regulation of temperature, oxygen addition, and moisture, ideal conditions are set up in the digester to promote natural and added bacteria of decomposition in the material. After 24 hours the refuse is fit for use as compost which resembles forest soil in structure and appearance. The products are successfully sold to about 1,500 Swiss consumers. The cost of operation per ton depends on the amount processed; initially this was about $3.50 based on 11,000 tons of refuse.

REDUCTION

66-0299
All aimed at cutting handling costs. Public Cleansing, 56(7):325-328, July 1966.

The International Mechanical Handling Exhibition, held in May, 1966, had on display a wide variety of new methods, new systems and new ideas to reduce handling costs. The machinery included conveyors, cranes, industrial trucks, elevators, hoists, electrical and electronic control equipment, container systems, and storage binning, many of which give rise to ideas for application in public cleansing. One of the most interesting exhibits from the refuse handling viewpoint was 'Wastepaktor,' a product from the U.S. It consists of three main elements: a compactor unit with hopper above it, a closed metal container, and a roll-on device fitted to a transport vehicle. The compactor unit, which is static, has a hopper of 2½ cu yd capacity and has a hydraulically operated compactor plate with single or continuous cycling. A container of 30 or 40 cu yd capacity is locked onto the compactor unit for filling. Waste material is tipped into the hopper and compressed into the container under a pressure of up to 112,000 lb. It is claimed that light waste is compressed to about 25 percent of its original volume. Three photographs of the Wastepaktor and a photograph of a Dempster-Dinosaur 11S are given.

66-0300
American Public Works Association. Grinding food wastes. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.231-252.

The grinding process is defined and the equipment available is classified. Both the acceptance and rejection of home grinders may be of vital importance to the city according to the adequacy of its sewers or sewage treatment plant. The same comments may hold for grinders in commercial establishments and institutions. In the late 1940's the relationship of sewer grades, mean velocity of sewage, and sediment velocity of garbage was studied at the University of Texas. As evidenced by reprinted charts, the slopes of sanitary sewers then in use could satisfactorily transport the solid produced by domestic garbage grinders. The costs of sewage treatment for a home garbage grinder is usually about 50 cents to $1.50 per capita per year. Types, location, and costs of municipal grinder station are covered. The garbage from a city of 80,000 people can be disposed of daily at a station that grinds 5 ton per hr or even less. Grinder stations in large cities are furnished with highly mechanized units that can process 30 to 50 tons of garbage per hr. The cost of installation of a home grinder varies from $75 to $200 or more, a 1½ horsepower commercial grinder is about $600--the cost of a 5 horsepower grinder rising up to $1,600. A 300-ton per day plant requires a sizeable capital investment. The building alone would probably cost $300,000. City reports say that a ton of garbage processed comes to $3 and more. Concluding remarks prognosticate the increased use of home grinders.

66-0301
Bourgeois, M. An economic solution to the problem of treating domestic refuse. Public Cleansing, 56(7):329-331, July 1966.

Controlled tipping as a solution to refuse disposal problems is only provisional. The nuisance and danger of the refuse, encouraging flies, rats and pathogenic germs, fires, and smoke cannot be ignored. The town of Sarcelles in France chose a refuse-reducing plant as the more suitable solution to its refuse disposal problem. Incineration was considered too expensive for a town this size (45,000). The refuse from the collection vehicles is tipped into a 40 cu yd reception hopper (which has a two-hour standby capacity), thence into a Gondard machine, which is fitted with a grill of a size to handle 12 tons of untreated refuse per hour. Interlocking control switches are fitted to ensure that the grinder cannot be overloaded. The material which cannot be pulverized, e.g. metal, leather, plastic bottles, and nylon waste, about 5 percent of the input, is automatically rejected. The pulverized product is transported by a 45-ton truck to a stockpile where it is left to undergo fermentation in the open air. The fermentation process starts at once. The temperature in the heap of end product builds up to 50 C in a few hours and reaches approximately 70 C in 25 hr. Agriculturists can effectively use the end product which is an excellent fertilizer as well as a proper humus rich in the oligo elements.

Reduction

66-0302
British-made disintegrator. Waste Trade World, 109(17):14, Oct. 22, 1966.

A range of British-made crushers and disintegrators, which can reduce wood, cardboard, paper, plastics, leather, rubber, cloth, metal sheets, glass, bricks, stones, and concrete blocks to a predetermined size, is described. Materials, which are converted into a flat shape by converging crushing belts, are conveyed and supported on a series of rotating, star-shaped anvil blocks. A series of staggering rotating disintegrator bars pass between the anvil blocks at high velocity, striking and penetrating the material on the blocks. The degree of reduction is based on the velocity of the disintegrator bars and the number of impacts per unit distance. Wet or dry particles can be processed and materials can be separated at the discharge end by magnetic or air stream separators. The standard unit is designed to produce up to 5 ton per hr of shredded cardboard, fiberboard, and general wastepaper.

66-0303
Busfield, J. E. New refuse disposal system for the smaller authority. Surveyor and Municipal Engineer, 128(3887):27-28, Dec. 3, 1966.

There is a need for a method of treating refuse which can be used to combat the complicating factors which have developed in refuse disposal in the last 20 years and be capable of operation by small as well as large authorities. The factors of concern include: population increase, the changing composition of refuse, increase in the bulk of the refuse, increase in the quantity of refuse per head, decrease in tips, and greater demand for control of nuisances from refuse. The Vicker's Seerdrum equipment appears to offer a solution to the problem for the small as well as large authority. The Seerdrum is a rotating refuse macerating plant with a drum 24 ft in length and 8 ft in diameter, fitted internally with plates, screens, and a refuse moistening device. The drum rotates at 11 rpm and is capable of reducing the bulk by half, while treating 40 to 50 tons a day. Paper, vegetable matter, etc. are macerated while metal, plastics, rags and wood make up the rejects. The macerated refuse makes a good cover for the rejects and discourages vermin and flies by heating up to 160 F. A picture showing a general view of the plant has the caption that the installation was done on a shoe-string, in the cheapest and simplest way possible. Three other pictures show: typical rejects such as tins, old boots, sacks, and plastic bottles, the loading of the Seerdrum with crude refuse, and the piling up of the product. A bar chart is given showing the steady growth of the refuse density in a typical British city from 3 cu yd per ton in 1948 to nearly 8 cu yd per ton in 1963. The Seerdrum was found to be the answer to many of the problems in the treating of refuse, such as fires, flies, and lack of tipping space.

66-0304
Grinding solid wastes. Compost Science, 7(2):30, Autumn 1966.

The Heil-Gondard wastes reduction system uses a low chimney or discharge chute over the grinder. The hammermill rejects material that cannot be ground so that sorting and grinding are done in one operation. A pit with a pan conveyor bottom replaces the conventional pit.

66-0305
Meyers, A. F. Grinding--an air in refuse disposal. Public Works, 97(5):156, May 1966.

The Heil-Gondard solid wastes reduction system makes possible combined collection of all domestic combustibles and non-combustibles at one time. It uses a low chimney or discharge chute over the grinder. Through this chimney the hammermill rejects non-grindables which are thrown out of the mill and passed into a bin for final disposal. Sorting and grinding are done in one operation. As the load on the grinder rises, the conveyor slows down, reducing the rate of feed into the mill. In a Heil-Gondard mill, all materials to be incinerated are shredded and intermixed to provide a relatively uniform particle size for the incinerator furnace and also a fairly uniform heat content per pound of fuel. Percentage of burnable material in the ash is reduced when ground refuse is burned. The cost of the grinding equipment is offset by simplification of the incinerator equipment. Also possible is a reduction in haul distance through the use of milled material at small incinerators or landfills located nearer to population centers than is feasible for large disposal installations. Compaction characteristics of the ground refuse are so favorable that uncovered fills are used without nuisance in a number of French installations. Where composting is economical, the Heil-Gondard mill performs the sorting and grinding in one operation and the final output of the mill is ready for composting. Two-stage grinding and screening is eliminated.

66-0306
New Gondard plant for Haarlem. Public Cleansing, 56(4):170-172, Apr. 1966.

Haarlem, Netherlands, was well satisfied with their 3 Gondards--one for pulverizing and two for secondary grinding--but they noticed that the hammer wear on the grinders was high. They now commission 6 Gondards, 4 for receiving unsorted raw refuse and 2 for grinding. The material passes over two screens, a course and a fine, and results in a fine grain product ideal for land reclamation. Since this material settles quickly and does not attract birds or rodents it is used for building up levels in water-logged areas. The idea of recirculating the coarser material until it will pass through the fine screen ensures a pre-determined size for the secondary grinders. A high but constant rate of feed results in faster throughput and better end-product. Each Gondard has a separate reception hopper for its raw refuse, when it is fed by conveyor belt into the machine. The area covered by the whole complex of four reception hoppers, six Gondard refuse reducers, and the ancillary stores, controls, offices, garages, and reject compound is remarkably small.

66-0307
New pulverization plant in Gloucestershire. Public Cleansing, 56(7):364-366, July 1966.

A 32.5 ton per hr rotary pulverization plant designed to serve a present population of 77,000 and projected increases during the life of the plant opened on April 23. The site is 2.35 acres, triangular, and easily accessible. The haul to the principal disposal site, clay pits likely to last 10 to 12 years, is about 2 miles. Pulverization was chosen after careful consideration of other methods, with particular regard to air pollution, odors, and the marketing difficulties of disposal of compost for agricultural and horticultural purposes. The plant has a reception hopper (capacity: 150 cu yd) that is below ground level. The refuse, after removal of bulky material that might damage the plant, is moved by an inclined elevating conveyor to the picking conveyor where salvageable material is removed by hand. An electro-magnetic separator removes ferrous metal which goes by chute to balers.

66-0308
No cover material needed for converted refuse. American City, 81(2):18, Feb. 1966.

The Bullingdon Rural District Council at Wheatley, England, recently installed a Vickers Seerdrum Refuse Conversion Plant that reportedly eliminates the need for cover material at the landfill. The plant separates the refuse into a peat-like product and rejects material such as tin cans, rags, plastics, and rubble. The product can be used as a cover at the landfill. A special metering pump adds water to the refuse as soon as it enters the 29 by 8 ft drum through the loading throat. Flight plates fixed to the drum elevate the refuse through a fixed crushing cone, forcing it into the first 12 ft of drum length. Special deflection plates churn the refuse while still retaining it in the drum. After approximately 45 minutes, the brokendown material spills over into the screen cylinder section, which screens out the peat-like product and rejects. The secret of the process lies in the addition of water to bring the moisture content of the rubbish to approximately 40 percent. This reduces the tensile strength of fibrous materials, thereby facilitating their breakdown by the tumbling action. The final product is free of blowing paper and dust, does not attract vermin, nor give off a bad odor. Its density is 2.5 cu yd per ton when discharged from the plant. Bacterial activity at the fill further reduces the volume by about 20 percent. The plant and building can be moved to a new site within a matter of days.

66-0309
Pfeiffer, E. E. Comments on the construction of grinders for urban refuse. In International Research Group on Refuse Disposal (IRGRD), Information Bulletins 9-12. Washington, U.S. Department of Health, Education, and Welfare, 1968. p.[illegible].

The following are discussed: [illegible] the size of the mill; feeding the mill; hammers; selection of hammers; accessibility of the mill; the grates; dead space in the mill; and volume reduction. Hammermills for grinding urban refuse are severely tested by two factors: (a) by the irregular sizes and shapes of raw refuse materials; (b) by the quality of the materials. Under no circumstance should the desired average capacity only be used as the basis for selection of a mill. Charging the mill should be done as uniformly as possible. The mill hopper must be large enough to admit coarse and bulky pieces. The width of the intake should correspond to the width of conveyor belt. Care must be taken to prevent build-up of a sticky abrasive mass. The grates below the mill must permit the material to pass through immediately. The distance from hammers to breaker plates is optimum at 5 mm, with an upper limit of 10 mm. Worn cutting edges are rewelded and welded material must be tempered. The design of grates beneath the mill appears to be the least adequate in present-day mills. Distances between hammers and mill housing should be sufficient to pass the desired hourly output but not to allow for accumulations to pack and 'cement.'

66-0310
Refuse compressors. Royal Society of Health Journal, 86(1):45, Jan.-Feb. 1966.

The manufacturer's announcement describes pneumatic equipment now being produced in Britain which automatically compresses and fills all types of refuse into disposable paper sacks. Fully automatic and semi-automatic compressors, adaptable to various applications such as apartment buildings, hotels, restaurants, hospitals, and factories are available. With the automatic compressor, which is charged from a chute, the material is compressed as it is filled into the sack, then moved out and stapled as a fresh sack is fed to the machine from a cylindrical magazine. The semi-automatic equipment is loaded manually and the compression action is actuated by a button. The semi-automatic models are indicated as ideally suited to areas where compressors are needed at strategic points.

INCINERATION

66-0311
Adds to private incinerator complex. Refuse Removal Journal, 9(7):16, July 1966.

A $2 million privately-owned refuse incinerator complex is being completed in Sharonville, Ohio. The latest unit, an electrically fired unit with a 150 ton per day capacity, is scheduled to open in August and will handle wood. A 250 ton per day incinerator has been in operation since 1962; it burns food waste hauled by contractors. A second 150 ton unit, designed for trash burning, went into operation last March.

66-0312
All-purpose incinerator to halt dual collections in Milwaukee. Refuse Removal Journal, 9(7):24, July 1966.

Agreement has finally been reached between Milwaukee and Milwaukee County on the question of financing a number of large, all-purpose incinerators. Agreement with suburban supervisors was reached, when it was decided to finance with revenue bonds. The initial construction costs will be borne by the entire county, but operating expenses will be charged to the municipalities using the disposal facilities. Each community will keep its own refuse collection department. The project is estimated to cost $15-20 million.

66-0313
American Gas Association, Inc. Approval requirements for domestic gas-fired incinerators. Cleveland, 1966. 32 p.

A USA standard approval for domestic gas-fired incinerators is presented in its entirety. The requirements represent minimum standards for performance, safe operation, and substantial and durable construction. The various provisions and tests prescribed are based on past experience in the utilization of gas, and the results of extensive research. They are designed to assure safe and efficient performance. Safe and satisfactory operation of a domestic gas-fired incinerator depends to a great extent upon its proper installation. Part one covers the construction requirements, part two covers the performance requirements, and part three lists definitions. Methods of tests for the various performance requirements are discussed and outlined. Relevant data are tabulated and illustrations are furnished, as well as various equations for pertinent calculations.

66-0314

American Public Works Association. Central incineration. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.140-197.

The history of central incineration since 1870 is given and its advantages and disadvantages are shown. Both construction and operation costs vary with the amounts and kinds of equipment and facilities in the plant. Most incinerator plants cost from $3,000 to $4,000 per ton of rated 24 hr capacity to build and equip. Buildings account for from 40 to 76 percent of total costs: furnaces and appurtenances account for from 18 to 24 percent of the total; and the chimney accounts for from 4.5 to 11 percent. Proper determination of the plant location and size is of importance, and consideration must be given to facilities for handling refuse. The combustion of refuse, parameters of design for refuse furnaces, and analyses of the role of refractories and chimneys are discussed. Residue handling sometimes creates a problem to be contended with. Based on previous specifications, the requirements of the architecture and construction of the plant, its operation and maintenance, and problems of air pollution control are summarized. Particle size and chemical analysis of fly ash from various sources are compared.

66-0315

American Public Works Association. Incinerator Institute of America 1958 standards for design of home incinerators and classification by types of refuse burned. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.466-475.

The standards contain incinerator terminology, waste analysis, classification of incinerators, and specification of incinerators by classes. Criteria applied in waste analysis cover the heating values of waste in BTU per lb as fired, percent of moisture, and percent of incombustible solids. Incinerators are classified according to the storage capacity and burning rate. Maximum burning rates in lb per sq ft per hr of various types of waste are tabulated.

66-0316

American Public Works Association. National Board of Fire Underwriters 1958 standards for installation of domestic incinerators as recommended by the National Fire Protection Association. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.476-489.

The standards give exact definitions of some words used and list publications with information on testing devices and materials for tests in compliance with the standards established by the Underwriters' Laboratories, Inc. They deal separately with domestic type incinerators, flue-fed incinerators of the apartment house type, and commercial and industrial type incinerators. The section on domestic incinerators specifies their application, design and construction, the gas burner connections, electrical connections, mounting, clearances, and the flue and air requirements. In regard to flue-fed incinerators special attention is given to the combustion chambers and the combined refuse chute and smoke flue parameters. The commercial and industrial incinerators have moreover necessitated specification of the incinerator rooms of compartments, refuse chutes, chute terminal rooms, charging chutes and enclosures, automatic feeding systems, incinerator chimney, ventilation of incinerator rooms, etc.

66-0317

American Public Works Association. On-site incineration. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.198-230.

On-site incineration applies to houses, apartments, stores, industries, and hospitals. Its pros and cons are stated and the on-site incinerators are classified. Incinerator evaluation covers burning with and without auxiliary fuel, costs, safety, nuisances, and effects on municipal disposal costs and practices. Charts are presented showing ignition-temperature cycles for a dehydrating household incinerator and a high BTU input house-hold incinerator, and data for the estimated annual capital, installation, maintenance, and fuel costs for three types of domestic incinerators are tabulated. The municipal regulations for on-site incinerators are interpreted in terms of design, construction and installation standards, operating standards, testing and licensing. Specific features are discussed pertaining to incinerators for commercial establishments, industry, and hospitals, with special emphasis given to the apartment house incinerators. Numerical data are presented on the average daily production of hospital wastes. Concluding remarks attempt to preview the future of on-site incineration.

66-0318

America's largest incinerator. Public Cleansing, 56(1):20-24, Jan. 1966.

The largest and most modern incinerator plant in the United States, the Southwest Incinerator, located in Chicago, has a capacity of 1,200 tons. The burning section consists of four 300-ton rotary kiln furnaces. These furnaces incinerate refuse with a calorific value as low as 2,700 Btu per lb with maximum possible efficiency. Average weight and calorific value of the refuse is approximately 441 lb per cu yd and 3,600 btu per lb. Steam is generated from the incinerator waste gases by four 50,000 lb per hr waste heat boilers and sold to a private concern for distribution. Ferrous metals are separated from the furnace residue and sold to a private contractor for disposal. The addition of a wet bottom to the collector chambers in the furnaces has increased the ability of the equipment to remove fly ash from the gas stream. The plant has two radial brick chimneys 15 ft in diameter and 250 ft in height. They are the largest constructed for any incinerator in the United States. The plant has met the Chicago air pollution requirements under all operating conditions. Over-all costs for the plant were approximately $6,825,000. In addition to the incinerator furnaces and storage pit areas, the plant includes a Ward office, district office, storage room, scale house, and scale. Other aspects of the installation, such as tipping floor, refuse pit, operating floor, boiler water treatment, charging floor, machine room, chimneys, and ash removal floor, are described in some detail.

66-0319

Black and Veatch, Consulting Engineers. Disposal by incineration. Report on refuse disposal for northern Baltimore County, Maryland. Kansas City, Mo., 1966.

Refuse incineration was considered for the study area. Possible advantages included: small land requirement, central location and thus shorter haul, relatively inert and nuisance-free end product suitable for reclaiming marginal land, and constructing stable landfills. Preliminary studies indicated, however, that there was no income potential from salvage of metals and waste heat recovery. Relatively high investment cost, residue, and potential nuisance from truck traffic and air pollution if the plant were not well designed and properly operated were disadvantages examined. Three sites were evaluated for potential incinerator sites considering land costs, hauling costs, and basic site appropriateness. Full site utilization, plans for refuse hauling, air pollution controls, stacks, instrumentation, and control of the facility, structures, and miscellaneous equipment are considered. Economic analysis of the plan was made and annual cost developed for County ownership and operation of the 500 ton-per-day plant and for a residue and non-incineratable refuse landfill to be located on the site. Initial cost other than plant cost was considered to be $592,800 and $3,627,000 was estimated for plant cost. Labor costs, annual costs, and amortization were studied and breakdown charts of the figures are given. Total average haul costs estimated on the basis of 20 cubic yard collection trucks, average payloads of 5.0 tons and two man crews are considered. It was estimated at $141 per ton. Comparisons of costs for sanitary landfill and incineration are given.

66-0320

Bradford deals with more trade waste. Public Cleansing, 56(12):634, Dec. 1966.

The new separation and incineration plant in Bradford processed more trade waste in 1965 to 66, probably because the Clean Air Act prohibits the burning of refuse on commercial premises. Another noticeable trend was an increase in the amount of bulky objects collected. This was due to the increase in the areas of the city controlled by the Clean Air Act. $26,425 was received for the salvage collected and sold. This was an increase of $11,325 over the previous year. The total tonnage disposed of increased by 2,078 tons, much of the increase attributable to the maximum salvage capability of the new plant. Salvage amounted to over 20 percent of the total refuse collected. A breakdown by types showed that waste paper increased by 445 tons; textiles, including carpets, bagging, etc. by 20 tons; light scrap iron by over 50 tons; non-ferrous metals, particularly aluminum, more than doubled. Over 850 tons of tin and destructor scrap were sold.

66-0321

Brickle, F. J. The incinerator crane and its application in the building. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.54-59.

This sequel to a paper presented at the 1964 Incinerator Conference, which developed a guide for sizing the Incinerator Crane and offered criteria for the crane application requirements, places emphasis on fitting the crane into the building as well as preparing the building for the crane. Only crane units with capacities from 1½ to 3 cu yds are considered in this paper. A cross section of a typical building showing the charging floor and the crane runway is given. A 6 in. clearance between the high point of the crane and the lowest overhead obstruction is recommended, with sufficient side clearance. Other dimensions of the crane with respective clearance recommendations are given. Mainline conductors can best be located on the charging floor side in the runway beam, mounted above the runway rail vertically along the building column, or suspended from the roof truss. The latter is the most favorable because of easy maintenance and personnel safety. The key dimensions of the most commonly used rails in incinerators are given. The floating rail system, advocated by the major steel rail fabricators, allows for both lateral and longitudinal expansion, contraction and some mis-alignment. Significant changes and improvements with respect to the incinerator crane since 1964 include the Static Stepless Control, which has reduced maintenance and eliminated wear in the electric holding-brake.

66-0322

Bucket and grapple combination adds to incinerator efficiency. Public Works, 97(11):123, Nov. 1966.

Cincinnati's new refuse incinerator, which began operation late last year, is rated at 500 ton per day, and includes a highly efficient system based upon two overhead P. & H cranes, one equipped with a Blaw-Knox 71-301 8-tine grapple of 3-yd capacity, and the other equipped with a clamshell bucket. One crane is used to feed the furnaces and set back waste in the two storage pits. The other crane is used as a stand-by. During most of the 24-hr a day operation, the buckets are used for rehandling, mixing, and loading the charging hoppers, Monday through Friday, but during the peak refuse unloading period, the buckets are used as much as 50 percent of the time for moving refuse from the dumping ramps to more remote areas of each pit.

66-0323

Build shipyard incinerator. Refuse Removal Journal, 9(12):38, Dec. 1966.

The nation's oldest and largest shipyards, Newport News Shipbuilding and Dry Dock Company, has built a new incinerator and remodeled its container system. Replacing an incinerator which had been in operation since 1942, the new $350,000 incinerator is equipped to burn 100 tons of refuse in 24 hr. Under present yard demands, about 65 tons will be burned in a two-shift, 16-hr period. The new plant, built on an isolated site to minimize smoke and odor nuisance, is fed by a clamshell bucket which is controlled by a crane operator. It has an 80-ft stack of steel. The new collection system is based on Dempster Dumpster containers, boldly marked in orange 'Burnable' and 'Nonburnables'. In this way, steel and other salvageable scrap does not get into the incinerator. Some of the containers were converted to drop-bottom units for easier handling at the incinerator.

66-0324

Burn away the odors. Public Works, 97(3):84-85, Mar. 1966.

Construction of a fume incinerator as part of its sewage treatment plant has enabled San Diego, California to install its plant at a particularly advantageous point that lies in close proximity to residential and public areas. Outfall drops generate a total hydrogen sulfide concentration of 430 ppm. The heart of the incinerator is a heat generator that provides two-thirds of the 1,350 F required to destroy all odors; the remainder is provided by digester gas, or by other fuels when necessary. Incoming gas temperature is 80 F; stack discharge, 600 F. The fully automatic installation, which cost $175,000 can handle 23,000 SCFM gases at a maximum temperature of 1,500 F. Detailed descriptions are given of feed and mixing, control, burner design and components, safety features, and transfer operations with limited hp consumption allowances.

66-0325

Cerniglia, V. J. Closed-circuit television and its application in municipal incineration. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.187-190.

The conviction that closed-circuit television would serve essential functions in municipal incinerator design is currently being put to test at a highly mechanized municipal incinerator plant in Oyster Bay, New York, having two 250-tons-a-day furnaces. A survey of the three types of cameras in use in CCTV and an explanation of how the CCTV system works are presented. The installed system consists basically of four lightweight cameras, a monitoring console with two screens, control power unit, and multiconductor control cables. The equipment requires little space, is rugged, and is quickly installed and easily maintained. Operational electrical costs are estimated at $200.00 per year. Two cameras monitor the storage pit and crane operation, while one camera watches the fire in each furnace. Special attention had to be given to the protection of the furnace cameras from the intense heat, because their temperature tolerance extends to only 131 F and the furnace temperatures may be as high as 1800 F, the actual flame temperature reaching even 3000 F. Use was therefore made of an independent compressed-air cooling system. The arrangement of the alarm system and the monitoring control station is mentioned briefly and the advantages due to CCTV are listed. The most impressive one of the annual labor savings amounting to a possible $75,000.

66-0326

Cerniglia, V. J., and A. Friedland Smile--your incinerator is on TV. American City, 81(4):110-112, Apr. 1966.

Rehabilitating its existing 500 ton per day incinerator and incorporating advanced technology and procedures in a second plant of equal capacity at the same site has permitted Oyster Bay, New York, to operate both facilities with the same 58-man force that formerly was required for the old plant. One of the most important features is dual-camera closed-circuit TV to monitor the final and penultimate grates. The monitor can catch oversized objects, observe slagging, control grate speed, and coordinate loading/burning operations. Camera protection and operation are described. Other changes and innovations include recovering and reuse of water for quenching, dust-tight equipment, special types of sealants and linings, a storage bay for nonburnables, a sophisticated and complex equipment maintenance shop, provision of demountable assemblies in the event more stringent air pollution standards are imposed, and incorporation of esthetic considerations in external construction.

66-0327

Challis, J. A. Three industrial incineration problems. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.208-218.

Case histories are presented for the disposal by incineration of three types of chemical wastes, which require auxiliary fuel for their combustion. The wastes include a carbon/water slurry from an ammonia plant, a highly colored liquid waste generated during TNT manufacture, and a gas containing hydrogen sulfide. The original carbon disposal process proved inefficient because the carbon would not distribute evenly in the furnace and the rate of drying and/or chemical reaction was not high enough to permit the furnace to burn all the carbon. The solution was to find a way to pump the material through atomizing nozzles. Three methods available for decreasing the viscosity are: (1) the addition of a chemical dispersant, (2) the addition of a combustible fluid, and (3) the addition of water. The last mentioned process is further outlined. The unit performed in a very smooth manner and the burner handled all the ammonia plant carbon slurry. Various methods have been used to dispose of "red water", the liquor resulting from the TNT process. In incinerating "red water", two basic burner designs have been used: rotating kiln and stationary burner. Performance data are given for both facilities, stating reasons for which the rotating kiln design was finally given preference. The disposal of hydrogen sulphide is based on the method of oxidation to sulphur dioxide. The possible methods of carrying out this oxidation are given.

66-0328

Cousins, N. Refuse disposal. In Freedom to breathe. Report of the Mayor's Task Force on Air Pollution in the City of New York. New York, Mayor's Task Force on Air Pollution, 1966. p.138-142.

The New York Department of Sanitation maintains and operates 11 municipal incinerators with a total burning capacity of 9,210 tons of refuse per day. It has been estimated that these incinerators emit 38.6 ton per day of particulate matter. The City is one of the worst violators of its own Air Pollution Control Code. Typical test data are shown in tabular form for city and apartment house incinerators. First-stage corrective measures which were recommended include: upgrading of municipal and apartment house incinerators and evaluation of control apparatus; use of garbage grinders in certain areas; elimination of inadvertant burning in sanitary landfills; and collection of refuse dumped on vacant lots. Plans for future action should be initiated in the following areas: new methods of collection; alternatives to incineration such as composting; modern water-cooled incinerators for new housing developments; and new municipal incinerators with the latest design technology.

66-0329

Denver to test feasibility of halting home trash burners. Refuse Removal Journal, 9(9):33, Sept. 1966.

To reduce its air pollution problems, Denver will ask its householders not to light their incinerators at all on days when weather conditions are most likely to cause smog. On days when there is an atmospheric inversion, the city's building inspector will inform residents by newspaper, radio, and television. Denver's backyard refuse incinerators produce perhaps 3 percent of the total pollution. Denver has recently closed its municipal landfill to private contractors, and contractors now use newly created private landfill closer to the city limits. To determine how large the refuse disposal problem is, home owners in one of the city's ten sanitation districts will be asked to put all refuse into trash cans for municipal collection for a 2-week period.

66-0330

Disposable plastics not so disposable. Ceramic Age, 82(7):4, July 1966.

'Disposable' plastic containers are proving not easily disposable. In municipal incinerators, some of the plastics do not varporize properly, clogging revolving-grate, self-sustaining incinerator systems. The plastic discards, which are increasing at the rate of 4 percent a year, are also responsible for odors, gummy residue, thick smoke, and acid formation on burning. Proposed solutions include high-severity incinerators, which are costly, and more flammable plastics, which are opposed by safety groups.

66-0331

Disposal of municipal greases by burning. Public Works, 97(12):110, Dec. 1966.

A new self-firing incinerator, the Greaseburn, has been used since 1965 by the Water Pollution Control plant of Canton, Ohio, for disposal of fats, greases, and greasy skimmings. Developed by Walker Process Equipment, Inc., the unit is a forced-draft type circular hearth operating at high temperatures for continuous and complete incineration of these difficult by-products. Capacity is rated at 700 lb per hr, but performance has been found to be higher during periods of peak loads. Incineration is complete with a low volume of ash residue. Four other Ohio communities, as well as Gary, Indiana, also use Greaseburn units.

66-0332

Edwards, L. V. Smoke density measurement in municipal incinerators. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.183-185.

The opacity of optical density of smoke in the breeching or stack of a municipal incinerator is an index of combustion. The smoke meter is a useful operating guide, rapid in response, as compared to smoke density measuring by the Ringelmann chart. The photo-electric smoke meter reads smoke day or night with the same accuracy. It tells the operator promptly when combustion over the refuse bed is not up to standard and gives a direct indication of the effectiveness of an adjustment to the air supply or stoker in reducing smoke. The theory and principles of the modern smoke meter and types of readout are described. A guide is provided for the selection, specification, and installation of smoke meter, smoke alarms, and recording smoke charts.

66-0333

Electrostatic units to be employed by Indianapolis plant. Refuse Removal Journal, 9(12):54, Dec. 1966.

Electrostatic air pollution control equipment will be used in the planned $5.5 million municipal incinerator scheduled to be completed by January 1968. The facility has a design capacity of 1,000 tons of refuse a day. Plans provide for four furnaces, combustion chambers, stokers, storage bin, forced draft fans, cranes, bypass dampers, scale house, instruments, and associated equipment. Operation will be controlled by automatic electronic controls, including automatic billing for contractors. Indianapolis will be the first American city to use electrostatic units in a municipal refuse incinerator.

66-0334

Extraction and salvage or complete incineration" Surveyor and Municipal Engineer, 127(3849):23, Mar. 12, 1966.

The problem of the disposal of refuse which has developed from the changing character of refuse with its decreasing density is discussed in the report for the year ending May 31, 1965, by the Director of Cleansing of the City of Glasgow. There is a difference of opinion as to the disposal of the collected refuse-as to whether all of the refuse should be incinerated or whether the inert material in the form of dust and cinders and any salvage should be removed before incineration. While the quantity of dust and cinders will decrease with the extension of smokeless zones and the increase in central heating, the Glasgow refuse still contains 44 percent of dust and cinders. Over 20 percent of the central heating installations in Scotland still use solid fuel. There appears to be no sound logic for burning material in furnaces which has already passed through the household fires. The burning of whole refuse containing cinders and dusts increases the dust from incineration and adds to the problem of dust control which is acute because of the smokeless zones. If dust and cinders are to be extracted, then articles of salvage value should be recovered from the conveyors which take the refuse to the furnace. The salvage value from the Glasgow Polmadie and Govan works in the past year totalled 54,077 and the dust and cinders were used for creating recreational areas in the city and reclaiming waste land in farming areas. The argument appears to be in favor of removing ash, cinders, and salvage before incineration.

66-0335

Favor, A. B. Record keeping for incinerator plants. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.107-113.

The management of the labor force and the equipment in operating an incinerator plant, as well as the periodic reporting to public officials, includes the generation of accurate records. A description is given of a practical and simple system of records for municipal incinerator plants. Six sets of forms were designed (foremen's daily shift and superintendent's daily reports, refuse and residue records, and plant performance and cost records) enabling the recording and evaluation of refuse and residue volumes and tonnage, furnace performance, and costs. The relations between weight and volumes of refuse and residue are established. A yardstick for monitoring the completeness of refuse reduction is given which advises the management on the incineration process, signalling any need of changes in the plant's operation.

66-0336

Fife, J. A. Control of air pollution from municipal incinerators. In Proceedings; Third National Conference on Air Pollution, Washington, Dec. 12-14, 1966. Public Health Service Publication No. 1649. Washington, U.S. Government Printing Office. p.317-326.

Particulate matter forms the major source of incinerator air pollutants. Spray chambers' efficiency in reducing particulate emission varies with the number of baffle stages and with the details of the individual baffle construction. In order that the baffle be compatible with the natural-draft, batch-fed plant, it must be capable of meeting a criterion of 0.85 lb of particulates per thousand pounds of flue gas corrected to 50 percent of excess air. A multicyclone flue ash collector is sometimes used where more stringent conditions must be met. While this is very efficient for an expected particle size greater than 30 microns in size, it operates with much less efficiency below this point. The bag filter system utilizing a fiberglass cloth or its equivalent is not now applied to a full-size plant and collects particles of all sizes within its selected operating range. A wet scrubber depends on an extremely thorough mixture of water and flue gas which results in relatively high pressure drop. Scrubbers are among the higher efficiency dust collectors, and are non-selective as to the particle size collected and do remove gaseous air pollutants. Their water and power requirements must be closely considered in evaluating them for use. Precipitators are capable of high collection efficiency at low pressure drop. Efficiencies higher than 95 percent are possible and despite a higher first cost its total owning and operating costs may be competitive with other types or devices. Standardization of language and definitions within the field would be a helpful and logical development of air pollution criteria.

66-0337

Fife, J. A., and R. H. Boyer. What price incineration air pollution control? In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.89-96.

Seventeen possible combinations of air pollution control equipment for municipal incinerators are appraised through a statistical approach. Combinations include: refractor-lined and water-walled furnaces of identical capacities, gas tempering systems, mechanical cyclones, electrostatic precipitators, and the introduction of furnace gases directly to either a refractory-lined baffled spray chamber or to a wet scrubbing system. Thus, each furnace unit was equipped with a separate and independent air pollution control system. Furnace practices, gas-tempering devices, dustloadings to the various collectors, the cost parameters, and stack emissions are calculated and presented. Cost parameters include water and power cost fluctuations and installation labor differentials. The baffled spray chamber for installation in the flue gas path downstream from the furnace is described, as are the spray cooling chambers and induced-draft fans. The wet scrubber system removes dust particles from the gas by thoroughly dispersing the scrubbing liquid, mixing this mist with the gas, and causing the collision of dust particles and water droplets. Mechanical collectors utilize centrifugal force to separate suspended particles from the gas. Gases are introduced to the electrostatic precipitator at approximately 600 F, and the steps of the process are listed.

66-0338

Goder, R., and A. Marshalla. Incinerator testing programs 1966. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.231-234.

The progress on incinerator testing programs since the 1964 ASME National Incinerator Conference is reported. Actions of the Air Pollution Control Association and the Incinerator Institute of America are presented together with immediate objectives. The Incinerator Institute of America's new test charges, procedures, and instrumentation are presented against a background of test results accumulated and studied by the members. Field studies of large numbers of installations are hampered by complex testing procedures and the industry suffers from a lack of significant data for study. A new procedure to reduce the costs of stack emission tests is outlined.

66-0339

Golueke, C., and P. H. McGauhey. Future alternatives to incineration and their air pollution potential. In Proceedings; Third National Conference on Air Pollution, Wasington, Dec. 12-14, 1966. Public Health Service Publication No. 1649. Washington, U.S. Government Printing Office. p.296-305.

Landfill, ocean disposal, composting, wet oxidation, and pyrolization represent the main alternatives to incineration. Incineration is dry oxidation and its air pollution potential may be greatly minimized by efficient burning to remove particulate matter and, perhaps, removing objectionable fractions of stack gases. Sanitary landfill can be improved as a final disposal method if such ideas as reuse of landfills, improved methods of transporting refuse to landfill sites, which are becoming scarce, and creative use of landfills as reclaimed land for recreation and other purposes are implemented. Composting would be most suitable for applications involving the treatment of regional wastes in which the proper proportions of municipal and agricultural wastes can be supplied without the added problem of transporting ingredients to the disposal site. Present efforts in this direction have produced unexpectedly high capital and labor costs coupled with a failure to find a market for the end product. Anaerobic digestion, which follows a course similar to that of sewage sludge digestion, needs more research to broaden the scope of its applicability to constituents of refuse more resistant to digestion than garbage. Ocean dumping without pretreatment offers the same problems as open land dumps since usually the refuse is washed up on adjacent shorelines. Pressurized marine dumping, compacting refuse so that it will sink, is under investigation, but the long term effects of the refuse on marine ecology and on the refuse itself is not known. Both pyrolization and wet oxidation are in the R&D stage of development. These methods require essentially the same handling methods as incineration and may still contribute to local air pollution in the form of dust, vapors, and odors.

66-0340

Haedike, E. W., S. Zavodny, and K. D. Mowbray. Auxiliary gas burners for commercial and industrial incinerators. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.235-240.

The need for supplemented heat, and sometimes for furnace preheating, is recognized as a practical solution to the problem of low combustion temperatures. Although auxiliary heat can be supplied by preheating the combustion air, a much simpler and more economical method is the auxiliary gas burner firing directly into the incinerator furnace. Against the background of various classes of waste and incinerator fuels the burner location is evaluated and advantages are listed for the sidewall location. In view of the fact that package burners are complete units, requiring only fuel and electric power connection, the applicability of manual and automatic operating control, technical means of ignition, and thermoelectric and electronic flame safeguards is discussed. Special attention is given to spark ignition, mentioning briefly systems of non-electronic spark ignition. Three typical wiring diagrams are presented.

66-0341

Harrington, W. M. Public relations considerations in incineration plant location. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.105-106.

The location of a new incinerator frequently meets a well-organized local opposition. The author describes the efforts undertaken in Baltimore City to gain public approval of the proposed solution, outlining the public education campaign launched and the features of an instructive motion picture which was produced. Numerous factors are listed pertaining to the production of such a film starting with professional staffing (public relations consultant, professional producer), and the preparation of the script (length of time, selection of theme, description of the problem) and of the sound track. Indication is also given of several pitfalls to be avoided in the production of a film such as this and in presenting it to the public (preliminary projections, photography, use of the film, ownership of the final product, etc.).

66-0342

Herbert, D. B. The nature of incinerator slags. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.191-194.

The purpose of the paper is to form a basis for better understanding of slag conditions in incinerators. It is obvious that slag composition will vary according to the nature of the refuse charged and will differ widely from one installation to another. Therefore the slag samples were taken from three incinerators, from the point of greatest build-up immediately above the air-cooled silicon-carbide wall. Investigation included: a) fusion point and fludity characteristics, b) petrographic examination and c) chemical analysis. Results showed considerable variation in all properties determined, undoubtedly due to the nature of the refuse charged in each incinerator. Substantial variation can be expected from one incinerator to another in the amount present of such compounds as Al_2O_3, K_2O, SO_3, FE_2O_3, and ZnO, all of which can have a marked influence on the physical and chemical properties of the slag.

66-0343
High-temperature combustion destroys pollutants. Chemical Engineering, 73(15): 112, 114, July 18, 1966.

One possible efficient and inexpensive method of waste disposal is combustion at high temperatures. A new unit, which can handle any material, burns fluidized wastes at temperatures from 2,000 to 2,950 F. The unit can also burn slurried solids. The tall combustion tower is divided into three zones, A, B, and C Zone A is nearest to the ground, B is the middle zone, and C is the top of the tower. In zone A ignition and dissociation occurs. In zone B gas temperature build higher and oxidation of the constituents takes place. The constituents are ionized in Zone C. The unit must be heated for 4 hr before use. A holding tank stores the wastes until the proper temperature is reached. An atomizer/burner disperses the liquid into fine droplets and instananeous ingnition occurs. If the Btu content of the waste is at least 25,000 Btu per gal, other costs are negligible. The only labor needed is about 15 minutes a day for monitoring the equipment and servicing the instruments.

66-0344
High temperature disposal planned. Refuse Removal Journal, 9(7):29 July 1966.

An experimental incineration process has been undergoing tests in Fairfield, New Jersey. The process is said to produce a high-grade inorganic fill which is equal in volume to 10 percent of the original volume. For permitting the experimental project within its jurisdiction, Fairfield will get a license fee of $1,200 annually and have its waste incinerated at no charge. The municipality will also receive $0.10 per ton for all wastes incinerated from other areas. The experimental process burns material under very high temperatures while agitating it on a moving belt. A sum of $491,000 has also been requested from the Office of Solid Wastes to study solid wastes disposal for the next three years.

66-0345
Incineration by contract. Public Works, 97(9):164-166, Sept. 1966.

This article is a summary of 'Incineration by Contract is our Answer,' by Robert B. Steytler, Public Works, August 1966. Since sanitary landfill sites in St. Petersburg, Florida, were being depleted, the city was looking for an alternative method of disposal. Bids were requested from private enterprise to dispose of the city's solid waste. The scope of the specifications was that the bidder was required to bid a unit price per ton, and be prepared to take 300 ton per day over the next 20 years, and dispose of it by 'any nuisance-free method which had been proven in actual practice'. The bidders were required to agree that, should their plant not meet these standards, they would either correct the plant or shut it down and release the city from the contract. The specifications were also stringent in the qualification of bidders, with special emphasis on their financial background and solid waste experience. An escalator section to cover increases or decreases in cost over the life of the contract was also provided. Eight bids were received from pre-qualified entrepreneurs with the bids ranging from $3.40 per ton to $6.10 per ton. The successful bidder built a 500-ton incinerator plant rather than the 300-ton specified. Preliminary tests show that the incinerator is meeting or bettering the specification requirements in all respects. At the present time, a 100-ton composting plant is being constructed by private enterprise under a similar arrangement.

66-0346
Incinerator installations at Hong Kong. Public Cleansing, 56(12):611-614, Dec. 1966.

Hong Kong, because of its geographical location and because of its high density of population, has unique and acute problems of refuse disposal. Formerly, refuse was dumped along the shore of a bay leading off the Harbor. The need to reclaim this bay for industrial and residential purposes, together with the offensive odors and the Harbor pollution, caused the practice of dumping raw refuse to be ended. After investigation, it was decided that the particular problem could be solved best by large capacity incinerators, the heat from which could be used for steam generated electricity, desalination plants, or process steam. At the first installation the steam will generate 1.2 MW of electricity most of which will provide power for the incinerator and boiler auxiliaries. The other 50 percent of the steam produced will be piped to a nearby abattoir for sterilizing and other purposes. The first plant consists of four incinerators each with a capacity of 10.5 tons hourly, giving a total capacity of 1,000 tons per 24 hr day. The design is such that refuse of both high and low calorific value and with a wide range of moisture content can be burned. This is particularly important in Hong Kong where the type of refuse varies widely throughout the Colony, and there are periods of heavy rainfall. Since this disposal plant is at the side of the Harbor and near high-rise apartments, special attention was given to ensure that there were no smoke emissions, and, therefore, extensive grit and fly ash arrestor equipment was installed. The movement of refuse through the plant is described.

66-0347

Jens, W., and F. R. Rehm. Municipal incineration and air pollution control. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.74-83.

The history and development of municipal incinerator air pollution control in Milwaukee, Wisconsin is traced. Three new concepts in municipal incinerator air pollution control, developed by City and County of Milwaukee personnel are discussed. These consist of a new impingement-baffle fly ash collector system, an automatically controlled underfire-overfire air combustion control system, and a water recirculation, clarification, and neutralization system. Five different system modifications were evaluated at the Lincoln Avenue incinerator. A complete solids material balance on the plant was made, in addition to an analysis of the water used in the incineration fly ash system, air pollution emission studies, and other tests. Data are presented on the municipal incinerator plant's total performance utilizing these three systems, including the effect of varying capacity operation on the particulate emission performance.

66-0348

Kaiser, E. R. A new incinerator control meter is needed. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.176-182.

The performance of an incinerator is markedly affected by the moisture content of the refuse. The need for and merit of a CO2-H2O ratio meter have been shown, for use in controlling continuous incinerators by monitoring the changes in moisture content of the flue gas. The CO2-H2O ratio varies from 2.0 for refuse of 10 percent moisture to 1.3 for refuse of 30 percent moisture. While refuse moisture content is the principal factor affecting the CO2-H2O ratio, other minor factors are hydrocarbon content, air humidity, percent burnout of the residue, and content of inerts. The ratio is virtually independent of burning rate, percent excess air, furnace temperature, and barometric pressure. A CO2-H2O meter would assist the incinerator operator in decisions regarding stoker control and the adjustment of the underfire and overfire air supplies, so as to maintain a constant furnace outlet temperature at the desired burning rate. A description is given of an instrument and chart for monitoring the CO2-H2O ratio during tests. The instrument can be assembled from standard laboratory apparatus. The effects on the meter readings of firing rate, analysis of refuse, excess air, air humidity, and vapor from ash quenching are evaluated.

66-0349

Kalkhoff, A. W. Incineration vs air pollution-a necessary divorce. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.60-63.

The detrimental effects of air pollution are discussed and efforts to control pollution traced. Present pollution control codes lack uniformity and need revision. Los Angeles was one of the first cities to pass and to enforce a stringent code. To eliminate all possible pollution by incinerators, individuals and groups must work as a team, including planning and zoning boards, waste disposal authorities, engineers, builders, etc. The services of the Air Pollution Control Section of the U.S. Dept. of HEW, the U.S. Weather Bureau, and any other agencies should be secured. A buffer zone, such as park, or golf course around the area should be set up. The services of the press and other news media should be enlisted to make the public aware of the problem. A solid waste disposal unit should achieve maximum efficiency, by consuming the maximum amount of fuel (waste), at a minimum cost, minimum maintenance, minimum air pollution, and the minimum amount of process water. Suggested procedures include surveying the project, verifying the site selection, collection methods, analysis of refuse, and the future area of expansion of the community. The refuse must be analyzed to design the installation. More research is needed to provide the ideal incinerator.

66-0350

Kurosawa, K. Enriched air combustion of hard-to-burn refuse. Kogai to Taisaku, 2(11):771-773, Dec. 1966.

Enriched air combustion has some merits although it requires a great amount of investment. More oxygen means lower ignition temperatures. The reduction of inactive nitrogen decreases combustion smoke and keeps the heat constantly higher. The higher the flame temperature, the less the odor of combustion smoke. It is easier to remove smoke dust from reduced smoke. By adding oxygen, more wet refuse can be burnt, and subsidiary fuel, such as heavy oil, can be used more economically. An equivalent amount of combustion gas remaining inside the incinerator burns more refuse in the same incinerator with more oxygen. The oxygen content of the air is only 21 percent and the rest consists of nitrogen and argon. A large proportion of the combustion heat in the air is used for heating up the nitrogen. Refuse in Japan is generally more watery in comparison to that of western countries and more heavy oil is needed as a subsidiary fuel. Oxygen manufacturing equipment, which operates on the principal of separating oxygen from air by liquefaction, has made great progress and equipment with 10,000 cu Nm per hr capacities can be found in some iron and steel works and petroleum industry plants. Construction expense is assessed at approximately 800 to 900 million Yen for 95 percent oxygen at 10,000 cu Nm per hr.

66-0351

Lewis, J. Residential area accepts incinerator. Refuse Removal Journal, 9(9):18, 20, Sept. 1966.

A new incinerator began operation in April 1966 at Fort Lauderdale, Florida. The old incinerator, built in 1953, was the source of constant complaints of smoke, fly ash, and odor, as well as the open dump next to it and the old stack emitted clouds of black smoke. The new plant, with a 450-ton-a-day capacity, is described. It consists of a 2,300 yd capacity loading pit, the equivalent of two days' collections; a P & H crane with 5-ton static stepless control, and magnetic bucket control; hoppers; two furnaces, each rated at 225 tons a day; scrubber; vertical eliminator; and 96.5-ft-high stacks. Residue of refuse after incineration is about 15 percent; noncombustibles, tin cans, and glass-12 percent; and ash-3 percent.

66-0352

Merle, R. L. Kodak Park waste disposal facilities. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.202-207.

The Kodak Park incineration facilities provide waste disposal for all Eastman Kodak Company Plants in Rochester, N.Y. As a large industrial company with varied products, it has a wide range of wastes. The waste disposal facilities consist therefore of a monohearth incinerator, drier-kiln, oil-fired decontamination furnace, open field burner, and a fixed-grate incinerator. These facilities serve the burning and disposal, separately or in combination, of waste paper, chemicals, solvents, filter cake, sludges. Bulky objects and metals, especially silver, are recovered after burning. A study showed that in less than five years either a single new facility or combined facilities at a single site will have to be built. Consideration is presently being given to the possibility of including heat-recovery equipment in the new facility.

66-0353

Michaels, A. Status report. In Proceedings; Third National Conference on Air Pollution, Washington, Dec. 12-14, 1966. Public Health Service Publication No. 1649. Washington, U.S. Public Health Service. p.272-274.

Each year we dispose of 48 billion cans, 26 billion bottles and jars, and 65 billion metal and plastic caps and crowns, plus more than one half billion dollars worth of miscellaneous packaging material. When coupled with the population growth, an annual increase of 4 percent in waste generation is experienced. Disposal of this waste by all types of incinerators is estimated at 10 to 15 percent while approximately 40 percent of all refuse is disposed of by land filling both sanitary and otherwise. Of all the pollutants, 12 million tons per year, or 10 percent, is particulate matter and refuse. Disposal accounts for 3.3 million tons of pollutants or 2.6 percent of particulates from all sources. If the refuse which is currently being disposed of by combustion were properly incinerated the total emissions would be less than 1 percent of the total quantity. If all the refuse in the country were incinerated, and incinerated properly, only 1.5 percent of the total particulate emissions would be produced. The public is not happy with incinerators in their areas and this is easily understood, since it is estimated that 2/3 of the incinerators are poorly managed. The present status of incineration must be evaluated and a program set for the future.

66-0354

Monitor incinerator with TV cameras. Refuse Removal Journal, 9(10):48, Oct. 1966.

The nation's first closed-circuit TV monitoring system for a municipal refuse incinerator was installed recently at an Oyster Bay, New York, plant. Furnace operation is monitored constantly for slagging, burning conditions, and holes in the fuel bed. The supervisor can thus regulate loading and stoking operations immediately. Cost of the components was $25,000.

66-0355

Monroe, E. S. New developments in industrial incineration. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.226-230.

Improved calculating and design techniques, and performance rating of incinerators are reviewed. It is shown that more sophisticated calculation facilities and more reliable thermodynamic equilibrium data are available now. Their use in design calculations is the first step toward improved incineration. Good incinerators should have good combustion characteristics that operate at or near equilibrium conditions. Gas and liquid waste incinerators can be evaluated by their performance at or near stoichiometric conditions. Solid waste incinerators must be evaluated individually. Small test models may be used but each waste must be carefully evaluated. Descriptions are given of two novel incinerators recently developed, which have widely different characteristics that perform well in specified areas. The first is a two-stage unit whose unique feature is controlled, incomplete combustion in the large chamber. The second is an open-pit incinerator which permits radiation of the flame to the sky. Of particular interest is a curve of nitrogen oxide formation with varying excess air and temperature developed from thermodynamic equilibrium data that has been verified by field tests.

66-0356

Moore, R. C., and F. X. Reardon. A salvage fuel boiler plant for maximum steam production. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.232-238.

Batch feed installations with waste-heat boilers have produced from 1 to 2 lb of steam maximum per pound of refuse. Recent improvements in furnace design, continuous feeding of refuse and removal of residue have resulted in more constant furnace temperatures and thus in more efficient steam production. An explanation is presented of design features and the anticipated performance of an installation for maximum steam production using water walls in the incinerator furnace integral with a steam boiler. These relate to a project now under construction for the

Navy Public Works Center, Norfolk, Virginia. Calculations indicate that it is logical to expect an increase in steam production of at least 50 percent over earlier installations in this country.

66-0357

National Association of Counties Research Foundation. Community action program for air pollution control. Washington, 1966.

A series of eight Community Action Guides for Air Pollution Control was prepared to bring together for elected and appointed policy making officials and other community leaders the information needed to institute and to strengthen a community-wide program to control air pollution. Information was obtained from first-hand surveys of nearly sixty communities with air pollution control programs. The growing menace of air pollution and some of the practical solutions to pollution problems are highlighted. The guides will be valuable to the elected official who has primary responsibility for determining community policies and programs. They should be useful to administrators, county attorneys, planners, personnel directors, engineers, public works officials, and others who must deal with selected aspects of a total control program. The eight guides are: the areawide approach; organization; enabling legislation; enforcement; staffing; financial and technical assistance; gaining community support; and an action plan for instituting community air pollution control programs and bibliography. Numerous charts and illustrations are given. The project was supported in part by a Public Health Service grant.

66-0358

Natural gas incinerator: three-chamber unit proves efficient solution to old problem. Modern Sanitation and Building Maintenance, 18(2):13, Feb. 1966.

Trash at a Maryland restaurant had been collected in barrels and stored in back for burning in an adjacent field weekly. Now trash is consumed inside the building leaving a small compact pile of ashes easily stored in containers and hauled away. A natural gas packaged blower burner is rated at 150,000 Btu per hr. Incinerator capacity is 100 lb of wet waste per hr or 75 lb of dry waste. A heavy duty high temperature insulating refractory is used throughout. Air circulates through decorative grill work at the top. The restaurant installed a crushing machine which handles cans up to five quarts and glass up to one gallon. It is the only unit capable of crushing cans with both ends in place.

66-0359

Negherbon, W. O. Sulfur dioxide, sulfur trioxide, sulfuric acid and fly ash: their nature and their role in air pollution. New York, Edison Electric Institute, 1966. 1213 p.

A critical compendium is provided of present knowledge concerning the part played by the substances stated in the titles as air pollutants especially with respect to the health and safety of living organisms. Physical and chemical properties of sulfur compounds, meteorological factors, physiological considerations, effects of pollutants on animals and plants, effects of fly ash, and removal of pollutants from flue gases are included. A list of references and a subject index are appended.

66-0360

New incinerator to feature electrostatic precipitator. American City, 81(12):36, Dec. 1966.

Plans for an incinerator with electrostatic precipitators have recently been approved by the Board of Sanitary Commissioners of Indianapolis, Indiana. This will be the first time such precipitators have been used by a municipal incinerator in the United States. Other design features of the 1,000-ton capacity plant include draft fans to eliminate the tall stacks, automatic electronic controls, a grease incinerator to eliminate open-pit burning of grease, and the use of glazed material on the building to reduce maintenance and improve appearance. A sketch portrays the modernistic, extremely attractive appearance of the incinerator. The plant will cost an estimated $5,500,000, or approximately $5,500 per ton of capacity.

66-0361

New York to build 3,200-ton plant. Refuse Removal Journal, 9(9):20, 46, Sept. 1966.

New York City is planning to build a huge $30 million refuse incinerator that may provide usable steam heat as a by-product and will have advanced air pollution control devices. Located on the south Bronx waterfront, it will be able to handle 3,200 tons a day from all 5 boroughs. All refuse will be brought by barge; about one-third of the refuse will come from the Bronx and the remainder from the 4 other boroughs. Electrostatic precipitators, used effectively in Europe for some years, will be studied for possible inclusion in the plant. The use of boilers as gas coolers for the production of vast amounts of hot water or steam is also being studied.

66-0362
Norwark, H. R. The measurement of air and gas flow and pressure as applied to modern municipal incinerators. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.171-175.

The performance of an incinerator depends on the control of the air flow to the stoker zones and overfire nozzles, the furnace draft, and the pressure drop across auxiliaries. Nine measurements are in current usage, which may be indicated, recorded, or fed into the measured variable input of a controller in an automatic control loop. The principles of air flow metering, and simple, rugged pressure taps for fans, ducts and chambers, which provide input to instrumentation are described. Special consideration is given to the measurement of flue-gas draft and flow and the difficulties encountered herein. From the viewpoint of application of the most important factor is the selection of the primary element location. The use of relative values, as in percent of maximum flow, has a direct bearing on the simplification of the measuring equipment which can thus be made more rugged and reliable than precise test equipment.

66-0363
Open burning limit set up by Portland Refuse Removal Journal, 9(2):38, Feb. 1966.

To reduce air pollution, the city of Portland, Oregon now requires that all residents get a bonfire permit before burning refuse in the open or in portable domestic incinerators or barrels. House-holders' bonfire permits may be obtained on a day-to-day basis at neighborhood fire stations. They will not be issued on days when weather or other conditions make open fires a hazard. Portland radio stations announce each morning whether bonfire permits are being issued. Permits for open burning of rubbish from demolition, industrial or commercial operations, or highway construction will not be issued.

66-0364
Ozolins, G., and R. Smith. Rapid survey technique for estimating community air pollution emissions. Public Health Service Publication No. 999-AP-29. Cincinnati, U.S. Department of Health, Education, and Welfare, Aug. 1966. 77 p.

A method is presented for rapidly estimating the major emissions of air pollutants in a community. The method is based on information that is readily available in most urban areas; it does not entail extensive surveys or sampling procedures. Application of this survey method will yield a series of tables, maps, and diagrams that indicate: (1) the weights of emissions of selected pollutants, by year and by season; (2) the relative importance of various fuels and types of sources in producing the emissions; and (3) the relative amounts of pollutants emitted in various geographic sub-areas of the community. Such information constitutes a useful tool for developing an air conservation program.

66-0365
Peskin, L. C. The development of open pit incinerators for solid waste disposal. Journal of the Air Pollution Control Association, 16(10):550-551, Oct. 1966.

A newly developed open pit incinerator originally developed for the safe disposal of chemical wastes is described. A cross-section sketch shows the essential features of the installation which has an open top with a system of closely spaced nozzles which direct a screen of high-velocity air over the burning zone at an angle of 30 degrees to the horizontal. The nominal capacity of the incinerator is 3.4(10) to the sixth Btu per hr per ft of length. Good results have been obtained with liquid and solid wastes such as wood, rubber, paints, synthetic fibers, and plastics. While visible smoke is readily eliminated and fly ash can be readily contained by screening, no quantitative measurements of possible air pollution have been made. The device provides: use of the sky to absorb heat, simplified fuel handling, no grates needed with 100 percent overfire air, no need for skilled labor, no high maintenance, and low investment. In the burning, the only residual material was metal and ash particles. The device has a potential use in the incineration of bulk items found in municipal trash, the disposal of demolition lumber, and plastic materials which are increasing as a result of increasing use of disposable hospital items, such as syringes, culture dishes, tubes, and other medical devices. Originally the device was developed for handling wastes where an explosion hazard would have existed in a conventional enclosed type of incinerator. This simple open pit incinerator offers a potential for many types of incineration.

66-0366

Pope, and F. Deming. Refuse for fuel makes economical saline water conversion. Combustion, 37(7):20-21, Jan. 1966.

The conversion of saline water to fresh water has been handicapped by excessive operating costs, principally the cost of energy. In spite of improvements in design, the power to operate auxiliary equipment plus the steam required by the evaporator costs more than the total production cost of fresh water from conventional sources. The feasibility of utilizing the head available in refuse, sanitary wastes, and municipal sewage is explored. A figure is shown which illustrates a plant design in which all of the power generated by incineration is used in either the boiler and evaporator plant or to generate fresh water in a vacuum-compression-freezing process for fresh water. The first water-cooled furnace steam generating incinerator in the United States has been commissioned by the U.S. Navy for construction at Norfolk, Virginia. Another source of waste fuel is the development of a continuously renewable pulverized coal filter for primary treatment of sanitary wastes and municipal sewage. The use of five tons of coal makes available 11 3/4 tons of sludge per million gallons of sewage with a heat value of 5,300 per lb. Tables are given showing estimates of fuel and power costs of saline conversion plants and the values that apply to the heat balance diagram for each 100,000 persons. Half of the fresh water requirements for a city of 100,000 can be generated from sea water at no expense using waste fuel.

66-0367

Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. 266 p.

Thirty-four papers are presented in this design manual and reference work prepared by the Incineration Committee of the Process Industries Division, ASME. Contents include: municipal incinerator design practices and trends, incineration of bulky refuse, solid waste disposal, the incinerator crane, air pollution, characteristics of furnace emissions, chemical analyses of refuse components, specifications and legal responsibility, public relations, record keeping, refuse and sewage sludge incineration in Europe, boiler operation in Europe, electrostatic precipitators for incinerator gas cleaning, instrumentation specifications, measurement of air and gas flow and pressure in municipal incinerators, closed-circuit television, incinerator control meters, smoke density measurement, incinerator slags, silicon carbide refractories, industrial incineration, incinerator testing programs, auxiliary gas burners, fly ash control equipment, prefabricated chimneys, and process engineering.

66-0368

Purdom, P. W. Characteristics of incinerator residue. In Proceedings; First Annual Meeting of the Institute for Solid Wastes, Chicago, Sept. 13-15, 1966. American Public Works Association. p.38-42.

A research study, financed in a large part by the Division of Environmental Engineering and Food Protection, U.S. Public Health Service, is concerned with the quality of the ash residue remaining after incineration. The first stage of this project utilized two incinerators in the City of Philadelphia. One of these incinerators is a batch feed design and the other is a traveling grate design. Because of the large quantity of both raw and incinerated waste involved, the establishment of a sampling procedure was of the utmost necessity. The results of chemical analysis of incinerator residue from the two incinerators are shown in tabular form. The quality of the residue does vary significantly and should be recognized as a criterion for design and operation. It appears that the effectiveness of an incinerator can be measured by the calorific value of the residue as it comes from the incinerator.

66-0369

Refuse disposal system planned for Milwaukee County. Public Works, 97(12): 131, Dec. 1966.

Milwaukee is organizing a county-wide refuse disposal program under the County Department of Public Works to study all aspects of incineration.

66-0370

Regis, A. J. X-ray spectrographic analysis of incinerator slags. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.195-201.

A series of incinerator slags of diverse chemical compositions has been analyzed for Al203, Si02, K20, Ca0, P205, Fe203, Ti02, and Zn0 on a Norelco-Philips all-vacuum x-ray spectrograph. In sample preparation, precautions were taken to prevent the sample powder from being disturbed when under vacuum. Characteristic K alpha radiation was used for all elements and either vacuum or air paths were preferred depending on the elements to be investigated. Unfortunately, the quantitative chemical analysis of materials by x-ray fluorescence is strongly influenced by two factors: the resulting calibration curves are only as good as the wet chemical analysis on the standard samples upon which the curves are based, and secondly, the more analyzed standards one has for his working curves, the greater the accuracy one can obtain. For the reported study only three analyzed slags were available for the calibration curves and since the chemical analyses on these were done on a routine basis, doubt was expressed as to their precision. The results show that the analysis of slag type materials by instrumental methods have not only the desired accuracy but also the time it takes for a complete analysis is much shorter than that required by the wet chemical methods. It is pointed out that the calibration curves obtained are good only for the Norton Company instrument, as every Norelco x-ray unit differs electronically. However, the general procedures and techniques described will apply to every instrument.

66-0371

Schroder, C. H., and E. C. Prowse. Silicon carbide refractories in incinerators. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.199-201.

Silicon carbide refractories have unique properties for preventing slag and clinker adherence on the lower walls of incinerator furnaces. The properties of silicon carbide are compared with a high grade, first quality brick to prove the above statement. The performance characteristics of silicon carbide refractories in incinerator service are discussed. However, a trouble-free and effective operation will be achieved only by a proper design and application. By providing a cooler, heat-conducting surface to the fire and hot ash particles, clinker and slag adhesion is prevented in the zone where such agglomeration would interfere with stoker operation and good fire behavior. Properly installed air-cooled silicon carbide greatly increases the potential life of the surrounding fire brick areas in the primary combustion chamber.

66-0372

Schulz, J. F. Prefabricated chimneys. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.246-251.

The history of the development of the prefabricated chimney and its use with incinerators is reviewed. The safety standards of the Underwriter's Laboratories are described and several types of such chimneys analyzed, including residential, commercial, and industrial. Particular attention is drawn to the proper design of the chimney-chute system, and items included in a typical high-rise chimney system are listed. The separate refuse chute system is described. Wall construction is given for a range of sizes and heights.

66-0373

Stephenson, J. W., and A. S. Cafiero. Municipal incinerator design practices and trends. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.1-38.

The findings of a survey of design practices covering plants built or designed since 1945 are reported. Data are presented on 205 plants for which questionnaires were returned, with note made of indicated trends in design practices and types of equipment. Numerical values for areas, volumes, burning rates, etc., for individual plants are not included in the summary; instead, maximum, minimum, median and average values, are presented in the text in graphic and tabular form to indicate ranges and trends. The range of plant capacities showed that the maximum plant size increased from 400 to 1,000 tons per day between 1945 and 1955, and to 1,200 tons per day in 1959. Plants of 100 tons per day or smaller capacity continue to be built, but the trend is toward larger plants. A definite trend to larger furnaces is clearly evident. A definite trend to bin-and-crane operation, with greater storage capacity, almost to the exclusion of floor dump was indicated. Enclosed tipping areas in the north is diminishing, with no definite trend in the south. The range of weights per cubic yard are shown, indicating a decrease of from 400-500 lbs per cu yd to 300-400 lbs today. There is a trend toward the continuous-feed type of furnace. Batch-feed furnaces are limited to a maximum capacity of 250 tons per 24 hr, and all larger furnaces are the continuous-feed type. Since 1959 all plants were deisnged with provision for fly ash removal and wet systems have been increasingly used. Manual residue removal has been essentially eliminated and designs continue to provide for direct dump from furnaces.

66-0374
Stickley, J. D. Instrumentation specifications-the key to a good system. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.167-170.

The instrumentation system is an important part of incinerator construction and operation. The key to a good instrumentation system is a good set of specifications, which assures high quality equipment, proper installation, and thorough testing. The problem of specification writing is examined showing that neither the 'tight hardware spec.' nor the too loose 'functional spec.' meet the requirements of the engineer and the municipality, and secure at the same time competitive bidding on the part of instrument producers. Specifications are suggested which will assure a good system in terms of results, with detailed consideration being given to instrument specifications, installation specifications, and instrumentation testing.

66-0375
U.S. Public Health Service. Proceedings; Third National Conference on Air Pollution, Washington, Dec. 12-14, 1966. Public Health Service Publication No. 1649. Washington, U.S. Government Printing Office. 667 p.

This volume covers the general nature of the air control problem and the unquestioned need for legislation, standards, and control of the situation. The problem of motor vehicles and control of their exhaust fumes is considered. The heat and power generation industry contributes to the problem mainly through the burning of fossil fuels. Standards and policy in this area and future possibilities of reduction of pollutants from this source are given. Industrial operations, including steel, cement, chemical plants, refineries, and foundries, are considered from the point of view of current status and future prospects. Solid waste disposal is a growing problem in itself. Its relation to the air pollution control program is considered and quality standards and disposal operations are discussed. State and interstate; local and regional air pollution programs are discussed with a view to improving present programs and developing new ones. The role of the federal government is considered and the socio-economic aspects of control are discussed. The speakers consider all the points mentioned and various Representatives and Senators give a Congressional view of the problems. The stated aim of the conference was to discuss the problem from the point of view 'Where do we stand on applying air pollution controls?'

66-0376
Vickerson, G. L. Fly ash control equipment for industrial incinerators. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.241-245.

A description is given of the problem facing the engineer when designing an industrial incinerator, referring especially to the treatment of particulate emissions from the incinerator between 35 and 200 microns in size. Principles of the dust separator functions are characterized and the operating parameters of various gravity chambers, inertial separators, dry and wet centrifugal separators, filters, wet scrubbers, and electrostatic precipitators are presented. It is concluded that the addition of water to the gas makes the problem more complex and that it therefore seems axiomatic to make use of dry equipment wherever possible. However, when temperature reduction as well as particulated reduction is required, one of the many scrubber designs should be investigated, bearing in mind that sludge removal, recirculation filtration and possible corrosion resistant construction may need to be supplied.

66-0377
Voelker, E. M. Control of air pollution from industrial and household incinerators. In Proceedings; Third National Conference on Air Pollution, Washington, Dec. 12-14, 1966. Public Health Service Publication No. 1649. Washington, U.S. Government Printing Office. p.332-338.

Equipment (which is easily handled and provides quick accurate readings) is needed to measure particulate and gaseous emissions from incinerators. A simplified and consistant set of standards for particulate emissions is needed. A set of charts is included which gives a simplified method of calculating emissions through consideration of the type of refuse burned. From the limited amount of testing being done, the industry has been able to conclude that an incinerator designed and built in accordance with the Incinerator Standards of the Incinerator Institute of America can be demonstrated to operate at capacity and not emit particulate matter in excess of 0.80 lb per 1,000 lb of flue gas corrected to 50 percent excess air. If a low resistance wet scrubber is added, 99 to 100 percent of the visible fly ash will be removed and 0.40 lb of particulate matter will be emitted. Smoke darker than No. 2 on the Ringelmann chart will be emitted for no more than 3 minutes per hr. It is recommended, that until such times as authorities can themselves perform tests to prove compliance or non-compliance, that the limits be couched in general terms.

66-0378
Walker, A. B., and F. W. Schmitz. Characteristics of furnace emissions from large, mechanically-stoked municipal incinerators. In 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.64-73.

A summary of field test and laboratory analytical data on dust emission from several large, mechanically-stoked municipal incinerators of different grate configurations is presented. The large, mechanically-stoked incinerator for the disposal of solid waste is coming under scrutiny because of its contribution to air pollution. Furnace particulate emmission under existing operating conditions was of primary concern. The three installations tested are described and shown in a schematic form. A description of test apparatus and techniques is given. The results appear to confirm the relationship between underfire air and particulate emmission previously established. There is little difference in the furnace emmission per lb of fuel for the grate configurations tested, and emission is primarily dependent upon underfire air rate and fuel composition, regardless of furnace size. By operating three incinerators of three different grate configurations, operating in three distinct types of municipalities in diverse sections of the country, a representative picture of furnace emissions in present and future practice was established. It is felt that the guidelines established for meeting maximum emission codes are realistic in the light of present knowledge.

66-0379
Winkler, T. E. Suburban communities join to plan refuse disposal. Wassser und Abwasser, 107(30):849-850, July 29, 1966.

In the southeastern part of Michigan, 14 communities joined in 1954 to erect an incinerator plant with a capacity of 450 tons per day. In the years 1963-1964, the plant was expanded to 600 tons. This idea was soon copied by other municipalities. The incinerator plant in Dearborn, which was recently inaugurated, consists of two furnaces to which two new ones will be added soon. According to an agreement, every participating municipality must pay $5,000 in advance upon joining the association. Each municipality dispatches two representatives to the meetings which take place on every first and third Tuesday of the month.

In these meetings problems are discussed, such as planned expansions of the plant, administrative tasks, etc. After one year, each community gets one vote for every 3,000 tons of waste. The number of votes per community varies between 3 and 8. (Appeared Public Works, 96(2):88, 1965) (Text-German)

66-0380
Woodruff, P. H., and A. W. Wene. General overall approach to industrial incineration. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.219-225.

Guidelines are given for planning a safe and economical facility for industrial waste disposal. Among the factors to consider are the types and quantities of gaseous, liquid, and solid waste; methods of collection; transportation; storage; and disposal. As a method of disposal, incineration is discussed in detail. Factors which favor incineration and factors affecting site selection are listed. The sources, quantity, and nature of the materials to be incinerated are defined, and some of the key data required are listed. Meteorological conditions and air pollution control requirements are observed and various incineration systems listed. Attention is also paid to storage, delivery, and ash handling systems, to atmosphere emission control, energy recovery, and the utility and safety requirements. Economic feasibility is surveyed and the basis for unit charges is defined.

66-0381
Zinn, R. E. Progress in municipal incineration through process engineering. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.259-266.

Process engineering is applied to the design of a new concept of a municipal incinerator. Each of seven incineration process areas (refuse unloading and storage, feeding refuse to furnace, primary furnace, ash removal and disposal, secondary furnace, flue gas cooler or waste heat boiler, air pollution control) are analyzed separately and the equivalent process in the chemical and metallurgical industries examined for proven design features applicable to incineration. Examples of integration of designs for process areas are given. Advantages of this new incinerator concept include lower cost, less construction time and adaption to prefabrication, and mass production. Items for further study include the development of improved grates and grate materials, methods for reduction of fly ash entrainment and for flue gas cooling, studies of thermal expansion problems and of the utilization of the granular portions of the ash residue after scrap metal has been removed.

INCINERATION–Europe

66-0382
Birmingham burns it up in a beautiful setting. Public Cleansing, 56(10):504-512, Oct. 1966.

The Castle Bromwich plant is the first in Britain to include an electrostatic precipitator for cleaning gases. The plant is also notable for its architecture and landscaping. It is in an attractive, wooded setting and its strikingly modern design shows what can be done to make refuse disposal plants a positive attraction rather than something to be hidden. The site is nearly 10 acres and is 6 miles from the city center. (A site plan is reproduced.) The plant can deal with 350 tons of refuse in two 8 hr shifts. There are two separate and complete units extending from the refuse receiving hoppers to the incinerators. The electrostatic precipitator and the chimney are common to both units. When maintenance or repairs are needed, only half the plant is out of commission. The flow of refuse is described.

66-0383
Birmingham's electro-precipitator installation. Public Cleansing, 56(11): 551-559, Nov. 1966.

The gas clearing equipment, the first of its type to be part of a refuse disposal plant in the United Kingdom, consists of a Howden/Lurgi electro-precipitator preceded by a Peabody conditioning tower and followed by induced draught fans. The waste gases, which may reach 2,050 F, are humidified and cooled in the conditioning tower by water injected through a series of high-pressure atomizing nozzles. These are automatically regulated. The gas is then extracted dry with a guaranteed dust collecting efficiency of 98.3 percent when handling a gas volume of 112,700 cfm at 482 F. A high uni-directional voltage is applied to the discharge electrodes which sets up a corona discharge and causes a stream of electrons and negative gas ions to go continuously across the gas stream to the collecting plate electrodes. The particles become negatively charged and go to the surface of the collecting plate electrodes where they are deposited. When the collecting electrodes are rapped, the dust slides down into hoppers below, where it is wetted and discharged into a culvert on the way to a settling tank. The gas clearing system is shown in a photograph and in a schematic drawing. A flow diagram and a detailed technical description of the process are provided.

66-0384

Bump, R. L. The use of electrostatic precipitators for incinerator gas cleaning in Europe. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.161-166.

Electrostatic dust precipitators of high efficiency are widely used in Europe to clean the flue gas from incinerators. The experiences of Lurgi Apparatebau Gesellschaft of Frankfurt/ Main, Germany, in this area are related. The introductory theoretical fundamentals bear upon the electrical, discharge wire, collecting surface, distribution, rapping, and disposal systems which form any precipitator installation. Lurgi pioneered the application of electrostatic precipitators to refuse incinerators. Two methods were developed to precondition the gas from the incinerator. Design and performance factors necessary for proper application of a precipitator to an incinerator are presented. Typical European values for precipitators on incinerators are tabulated and operating experience is summarized. Lurgi has also done considerable work on the development of a gravel-bed filter and a small 'packaged' precipitator for use on small incinerators. A typical installation for each of the developed Lurgi systems now at service is included, and comparative data on the various types of equipment which may be used to clean the exhaust gases from incinerators is presented in a table.

66-0385

Carter, B. C., and P. D. Quinn. Present experiences with incineration of domestic refuse. Public Works and Municipal Services Congress, Nov. 14, 1966. 20 p.

Gas-fired incinerators for the on-site disposal of domestic refuse are discussed. The developmental work and extensive field trials carried out on 'Refumatic' incinerators at Wolverton and Westminster, Great Britain are reported. Data is given regarding how both incinerators were set up, the problems that developed, what improvements were made, and what suggestions were made. Tables are given, representing the volume and weight of residue created, density and volume of refuse, reduction in volume and weight, quantity of refuse in terms of combustion chamber capacity, etc. The results that have emerged from these trials demonstrate that smokeless on-site incineration of domestic refuse can be effectively and economically carried out in a gas-fired incinerator. The reduction in volume of refuse is approximately 5 to 1, including tins, and approximately 8 to 1, excluding tins. As a general point, the residue is sterile. The amount of gas needed is recorded and these records indicate even further reduction can be achieved, by secondary burning operations. Also mentioned are some features of the Hubertus von Aulock oil-fired incinerator.

66-0386

Castle Bromwich refuse disposal works. Surveyor and Municipal Engineer, 128(3878): 446, Oct. 1, 1966.

The first of six pictures which comprise this report show the Castle Bromwich incinerator house. The mechanical charging equipment for the two incinerators located in the incinerator house are shown in another picture. The caption on the third picture indicates that it is part of the electrostatic precipitator plant for flue gas cleaning and the Howden-Lurgi precipitator and the ducting leading to the 245 ft high chimney is shown. Another picture shows a detail of the elevating conveyors which transport refuse from the reception hoppers to the rotary screens. These screens, 3/8-in. by 2-in. mesh, remove fine dust. Also shown in the same picture is part of the main duct work leading to the dust extraction plant. Part of the salvage recovery room with two of the four overband electro-magnetic tin separators are shown in another picture. The reception house, where collection vehicles charge loads into two 350-cu yd total capacity rubber-curtained concrete hoppers, is shown with two vehicles. The conditioning tower is shown where gases are cooled to 482 F before going to the electrostatic precipitator for cleaning.

66-0387
A continuous automated incinerator.
Smokeless Air, 37(140):110-117, Winter 1966.

A continuous automated incinerator, designed for the County Borough of Derby and situated on an island encircled by the river Derwent, will become operational in 1968. It has been designed for a throughput of 210 tons of crude refuse daily and promises to meet a performance guarantee that the organic matter in the residue will not exceed 3 percent. It was therefore necessary to make a detailed analysis of refuse collected during 1964 and 1965, which resulted in the establishment of an annual average calorific value of 4,677 Btu per lb. The plant design and layout, which includes a river bridge, access roads, ancillary buildings, public weigh-bridge, vehicle receiving area, and a refuse reception pit are described in detail and illustrated. In the reception pit a 5 ton long tine grab will smash furniture and wooden boxes within the confines of the pit. The incinerator installation, which is described in detail and schematically illustrated, consists of two main 7½-ton furnaces each equipped with an integral 'Gaserator furnace,' where items not desirable in the main incinerator furnaces will be destroyed. Each of the main furnaces is fired by two Class 'L' travelling grate stokers with single grates, these being arranged in tandem to provide primary and secondary burning units. The main furnace units each have a dust cooling chamber linked with the dust collector system, together with automatic submerged chain conveyor ash disposal systems to handle the discharge of ash, dust, clinker, and non-combustible material. Dust emission does not exceed 0.35 grains per cu ft at N.T.P.

66-0388
Continuous incinerator plant. Engineer, 22(5779):644-646, Oct. 28, 1966.

A £434,000 contract was placed with a company to build an incineration plant in Derby County which reduces unsorted crude refuse. The calorific value of combined refuse to be incinerated averages 4,677 Btu per lb. Total bulk can be reduced to one-eighth the original volume through complete combustion. The plant will be capable of consuming the daily refuse intake in 14 hr. An overhead crane serving the reception pit carries a 5 ton long-tine grab which is capable of gathering and raising 10 cwt of refuse. It can charge the feed hoppers of the two 7½-ton incinerators at a rate of 15 tons per hr. A shutter gate on the feed side is adjusted to control the depth of refuse fed onto the grate. The self-cleaning design of the travelling grate stoker insures continuous burning of refuse since air spaces never remain fouled by putrescribe materials. Dampers are arranged in transverse rows immediately below the grate surface to control air distribution. Secondary air is supplied for mixing the hydrocarbon gases with oxygen. To insure that dust emission does not exceed 0.35 grains per cu ft, waste gases are passed through mechanical dust collectors. Ash, dust, clinker, and non-combustible material is discharged from each stoker grate into a submerged chain conveyor. Plant diagrams are included.

66-0389
Derby's plant to reduce rubbish tips.
Engineering, 202(5245):750-751, Oct. 1966.

Lack of sites for the controlled dumping of refuse led the Derby Corp. to award a £434,000 contract for a continuous, automated incinerator installation, which is to become operational during 1968. The installation is designed for a daily throughput of 210 tons of crude refuse. Improvements include: mechanically operated grates, which were designed to work on the principle of total combustion and with a high degree of automation; and reliability with low maintenance and a high combustion efficiency with low grade fuels. During the years 1964 and 1965, 14 tons of crude refuse were collected and a detailed analysis of household refuse was undertaken. An average annual calorific value of 4,677 Btu per lb was determined. Illustrations present a model of the completed incinerator plant including landscaping, and a schematic diagram of the incinerator unit, which is also described in detail. It consists of two 7½-ton furnaces each with an integral 'Gaserator'. After incineration, cyclonic gas cleaners will remove most of the dust so that it contains less than 0.25 grains per cu ft on emission from the chimney. The ash residue and grate riddlings are transported to the dumping site.

66-0390

Electrostatic precipitator included in latest refuse disposal plant. Surveyor and Municipal Engineer, 128(3877):29-32, Sept. 24, 1966.

The description of the new Birmingham Corporation's £988,026 refuse incineration plant at Castle Bromwich includes the details of the electrostatic precipitator for flue gas cleaning which is the first for a refuse incineration plant in Britain. A general view of the industrial type facility with the 245 ft chimney is shown in one picture and a site plan is given showing the general arrangement of the buildings and equipment is included. A schematic side and plan views are given of the details of the electrostatic precipitator installation showing the conditioning tower in which the incinerator gases are cooled and humidified down to 482 F prior to going to the precipitator from 2,050 F at the entrance to the conditioning tower. The gas flow of the hot gas is 234,500 cfm at 2,050 F at the tower inlet and 112,700 cfm at the tower outlet at 482 F. A by-pass duct is shown which is for emergency discharge to the stack. The guaranteed dust collecting efficiency is 98.3 percent with an inlet concentration of 3.5 grains per cu ft and an outlet concentration of 0.06 grains per cu ft. The dust on the collecting electrodes when rapped mechanically falls into hoppers below and through rotary air locks into the flushing funnels where the dust is wetted and discharged to settling tanks. In the incineration plant, the refuse is screened, picked for salvage material of value, passed under overband electro-magnetic separators to remove the ferrous material before incineration. A considerable amount of trade waste and bulky waste is incinerated, but it is kept separate from the other waste. The dust removal system is the feature of this installation.

66-0391

Experiments and doubts at Wolverton. Surveyor and Municipal Engineer, 127(3857): 27-28, May 7, 1966.

The automatic gas-fired, chute-fed incinerator, the experimental installation operated by the Wolverton UDC in an 11-story block with the refuse from 59 apartments is described. There are access doors on each floor which maintain an air seal to the chute which leads to the primary burning chamber of the incinerator. As an added safety feature, the air pressure in the chute is kept slightly below atmospheric to prevent fumes from seeping into the building. The gas-fired equipment uses less than half a therm a day. The burning is thermostatically and time-controlled to permit the use of the most economical cycles for each installation. The smoke is burned in a secondary chamber and exhaust gases are scrubbed in a washer before discharge to the flue. A rooftop sealed flap opens automatically at night to allow hot gases to exhaust up the flue and clean it in the process. In addition to the 58 apartments, the refuse from 30 old peoples' dwellings are loaded into the incinerator once a day by caretakers. The running costs are low. One photograph shows the 11-story apartment building and another shows the front of the Refumatic incinerator. This development is part of a new town development which will eventually result in housing and employment for 250,000 now living in London. The planners are hopeful that the impact of such a population increase on water supply, sewage disposal, public utilities, and highways will receive adequate consideration. A map of the area is included.

66-0392

£500,000 incinerator contract. Public Cleansing, 56(8):417, Aug. 1966.

The first continuous incinerator process has been ordered by the Derby Corporation which will collect 210 tons of refuse per day. A Class 'L' stoker will fire the refuse in two furnaces, each capable of burning 7½ ton per hr. The plant will be in operation by early 1968 and the total cost will be about $800,000.

66-0393

Furnace with shakeout grate for incinerating abrasive sludge. Brennstoff-Waerme-Kraft, 18(5): 222, May 1966.

The boiler of a ball bearing plant is heated with coal as well as with the sludge coming from the ball bearing production. The sludge which cannot be dumped because of its oil content consists of sawdust, shavings, abrasion dust from grinding disks, steel dust, and oil. Its lower heating value lies between 3,000 and 3,800 kcal per kg, its ash content between 40 and 48 percent, its water content between 10 and 18 percent. At first the sludge was dropped onto the grate in batches. This method was soon abandoned because the easily flammable oil mixture started to burn immediately in the loading duct. Now the sludge is sprayed into the flame chamber by means of a jet of air. Part of the mixture is incinerated while it is still floating, the rest falls onto the grate whose shakeout action ensures complete incineration. Recently the loading of the sludge has been facilitated by a moving belt device. (Text-German)

66-0394
Gas incinerator for high buildings. Royal Society of Health Journal, 86(1):44, Jan.-Feb. 1966.

The design of the newest type of incinerator for high buildings such as high-rise apartments, office buildings, and hospitals is described. The flow diagram, which was shown at a recent exhibition, shows that the incinerator consists of a layered vertical chute which runs down through the building, discharging directly to the gas-fired burner, and a smaller duct parallel to the chute which acts as a vent by which the cleaned gases can escape. There is a wall opening on each floor by which refuse is dumped into the chute and which is under negative pressure. The incinerator is controlled by a time-clock and usually operates for about 10 minutes every two hours although the timing can be regulated according to the amount of refuse produced in the building. The smoke is burned in a primary combustion chamber and the gases are cleaned in a washer before entering the exhaust flue. The small quantity of ash should be collected daily. By tilting the grate, non-combustibles such as cans and bottles can be removed.

66-0395
Incineration of household wastes in a west suburb of Paris. Techniques et Sciences Municipales, 61:433-436, Dec. 1966.

An intercity plant for the incineration of household refuse of the Carrieres-sur-Seine suburbs is described. Located near Rueil, construction was begun in December 1962, and the plant was operational in March 1965. Capacity is 140 tons per day, for a total cost of 4,000,000 francs. This new plant replaces an old one which had been built in 1938 to 1939 to handle 60 tons per day and was rendered obsolete by increased industrial and suburban growth with their concommitant increased wastes. This old system is described briefly. The new plant utilizes an indoor pit with a capacity of 960 cu m to receive the wastes (can hold two days' collection). A 1,500 liter clamshell is operated at a fast speed so that 30 cu m per hr of refuse can be fed into the furnace. Total surface area of the grills in this Heenan and Froude furnace is 24 sq m, permitting complete combustion with reduced handling and minimum addition of air. The interior sections are plated with cast iron to protect them from the heat, which can reach 1,000 C. After combustion the cinders are automatically directed into a water-filled gutter where they are extinguished and collected for storage in a 25 cu m hopper. This hopper can accommodate the products of 12 hr of combustion. Fumes are passed through a classic system of cyclones equipped with a by-pass, so that the furnace can operate while the cyclones are being cleaned. (Text-French)

66-0396
London Centre discusses on-site incineration. Public Cleansing, 56(11):575-584, Nov. 1966.

L.G.A Leonard detailed his company's experiences with on-site incinerators. In January 1960 the London County Council asked them to give estimates of the cost of equipment, the amount of gas burned monthly, the size of the incinerator, the quantity of ash, the possibility of smokeless operation, and the hours of work and attention required by the caretaker. A tentative design was prepared and an experimental unit was built in 1960. Improvements have been made and installations have been made at four locations. Eleven design improvements are listed and were illustrated (at the meeting, but not in the published report) by colored slides. A.J. Marchant outlined the experience of the Westminster City Council with on-site incinerators. Some of the advantages have been a 7½ percent volumetric reduction; the possibility of hygienic storage of the residue of incineration because of its sterile nature (untreated refuse could not be stored); virtually automatic operation (the only manual operation is ashing). One of the problems overcome has been the accumulation of refuse over holiday weekends. Since the unit has been installed no special collections have been made during these periods, bulky items (armchairs, mattresses) have been fed into the incinerator after being broken down. Only one special collection of non-combustible items has been necessary during the 12 months the plant has been in operation. Costs are detailed. As far as smoke nuisance is concerned the unit goes 99 percent of the way to comply with the Clean Air Act. During the discussion questions regarding temperature, costs, and height of buildings were asked and answered.

66-0397

Mannhardt, H. Incinerator plant for the residues from foil production.
Brenstoff-Waerme-Kraft. 18(3):130-134, Mar. 1966.

The planning of an incinerator plant for a foil production company in West Germany is discussed. The combustion process in the existing facilities was observed and an analysis of the composition of the waste was made. The waste consisted of residues containing cellulose, which burned down normally but which had a tendency to backfire and plastic residues, which began to melt above 300 C. Thus two combustion chambers were required and the idea of a continuous loading of the furnace had to be abandoned. The cellulose residues were to be intermittently supplied to the combustion chamber. The plastic material was to be incinerated by blowing in air from the top of the chamber. A mechanical feeding of the plastic residues to the furnace was not necessary because of the small amounts accumulating daily. The heat obtained in the incineration process was to be utilized in energy production. The boiler was designed for a maximum capacity of 12 tons of steam per hr. The plant was constructed according to design and put into operation in February 1964. The combination of the two combustion chambers proved to be success, but it was necessary to modify several of the component parts.
(Text-German)

66-0398

Marchant, A. J. On site incineration.
Public Cleansing, 56(2):81-88, Feb. 1966.

Four main reasons why on-site incineration should be given careful consideration are: the volumetric reduction of refuse by this means is at least 7:1; the end product of incineration is a sterile matter which can be stored for much longer periods than untreated refuse; the results of volume reduction and longer storage will reduce the need for manpower; and the volume of refuse is increasing steadily every year. A British-made incinerator, installed in a block of apartments, is described in detail. The units are fed conventionally via hoppers on each floor of the apartments. A purge cycle takes place where the feed chute is purged by hot gases diverted from the chimney flue. This has the effect of destroying bacteria on the chute walls. The temperature achieved during this cycle usually reaches 190 F. Hoppers are designed to minimize the risk of blockages of the chute. Refuse fed down the chute, when entering the incinerator, is deflected by a sloping hearth into the main chamber of the unit. Since it is possible to set the burner to fire every hour if required, it is also possible to set the burning time 55 minutes every hour. A second burner is situated to fire across the mouth of the flue. A fan unit comes into action when the temperature of the flue gas reaches a certain point and thus acts as a cooling agent on the gases. A fan and motor incorporated in the incinerator provides the induced draft. A photograph and a schematic diagram of a 'Refumatic' gas-fired incinerator at Russell House in Westminister is shown.

66-0399

Moegling, E., W. Heitmuller, and W. Drewes. Practical experiences with the centralized incineration of sewage sludge in the example of Essen-Karnap.
Brennstoff-Waerme-Kraft, 18(5):215-222, May 1966.

In the power plant Essen-karnap of the Rheinisch-Westfalisches Elektrizitatswerk AG about 2,000 tons of sewage sludge are incinerated daily in addition to waste. Five furnaces are dedicated solely to sludge incineration. Each of the furnaces is capable of burning 25 tons per hr. In 1963 a mechanical sludge dehydration facility with filter presses was constructed. The wet sludge (water contents 85 percent) is pumped to the five sludge dehydrators reducing the water contents to 75 percent within 24 hr. In mixing tanks the sludge is ventilated. In a filter press the water content of the sludge is further reduced to 40 to 43 percent. The mechanical dehydration takes about 28 hr while a natural drying of the sludge would take 2 years. There are 12 filter presses, each one consisting of 100 chambers. From the dehydration plant the sludge goes to a storage tank at the incinerator plant. From there it is brought on conveyor belts to the furnaces. The sludge cakes are broken into pieces and fall into the drier. The flue gas necessary for drying comes from the boiler. The dried sludge dust proceeds to the furnaces. The plant has been in operation for more than 50,000 hr satisfactorily, so that four more boilers will be converted to sludge incineration. Details of the sludge processing facilities and the incinerators are discussed and shown both in photographs and schematic drawings. (Text-German)

66-0400

Muffle furnace for incineration of waste oil and tar. Brennstoff-Waerme-Kraft, 18(5):239, May 1966.

A muffle furnace suitable for incineration of waste oil, dyes, tars, pertinax dusts, solvents, etc. has a multipurpose burner equipped with nozzles made of bauxite. For sludges with solids up to a grain size of 3.5 mm, separate injection nozzles are installed. Tar is injected with steam. In the boiler the flue gases are cooled down to 380 C. A diagram illustrates the construction of the furnace. The capacity of the furnace is 700 kg per hr waste oil or 500 kg per hr tar. (Text-German)

66-0401

New continuous grate plant for Derby. Public Cleansing, 56(12):603-607, Dec. 1966.

The plant, an elevated drawing of which is presented, incorporates 'L' type travelling grate stokers and is scheduled to begin operating in 1968. The high capacity reception pit is designed to accept a total of 1,000 cu yd of refuse without trimming; this is five-eighths of the daily intake. A dust extraction plant to control air-borne dust is provided, and the automatically controlled conveyor moves refuse to the incinerator. There are two main seven-and-a-half ton furnaces with an integral 'Gaserator' furnace which will destroy animal carcasses and mattresses. The operation of the incinerator is described in detail.

66-0402

New refuse incinerator. Surveyor and Municipal Engineer, 127(3844):29, Feb. 5, 1966.

A description is given of the new continuous-rolling-grate refuse incinerator to be built by Tacol Ltd. under a license from Verienigte Kesselwerke AG of Germany. Since the original installation in Dusseldorf in 1961, installations from 100 to 1,500 tons a day have been installed. Two pictures are given, one which shows the grate and the other, a general view of an installation of the type that can handle from 100 to 1,500 tons per day. The grate consists of a series of rotating cylinders formed of fire-resistant grate bars. The refuse is tumbled from the first cylinder downwards with the destruction completed when the refuse reaches the last cylinder. The rotation of the cylinders and the quantity of air admitted can be varied to control the rate of combustion to obtain complete destruction of the refuse and leave only a clean, sterile clinker. With the incinerator temperature between 750 and 1,000 C, superheated or saturated steam for heating or power generation can be obtained by the addition of suitable boilers. Initial capital costs are competitive and with low operating and maintenance costs, the system is believed to have operated at a profit from the sale of waste heat in some instances. Tacol will probably announce further developments in pulverizing and composting machinery.

66-0403

Now a refuse 'flashpoint' in West Berlin. Public Cleansing, 56(9):441-442, Sept. 1966.

At the Conference at the German Institute at Berlin the members inspected the incinerator under construction for West Berlin. The plant, serving the northern part of the city with a 1,100,000 population, is designed to handle 2,100 tons (German) per day. The capacity of the hopper is 20,000 cu m. Each of the 7 incinerator units is designed to deal with 384 tons per day, operating 24 hr per day 5 days per week. Ash from the incinerator is to be burned and reburned and possibly used in building material, in an endeavor to dispose of everything without having to tip any residues. The costs as listed equalled £7,750,000. The working costs on full load of 2,100 tons per day is estimated at £2,135 per day and with 1,000 ton load, £1,662. The total staff expected to be employed will be 22 administrative and supervisory staff including tradesmen and 82 others, employed over three shifts.

66-0404

Oslo incinerator plant made in Germany. Staedtehygiene, 17(6):139, June 1966.

An incinerator plant for Oslo is under construction at Esslingen, West Germany. It will have two furnaces which will burn daily 156 tons of waste each in a 24 hr non-stop operation. The heat will be used for producing electric energy.

66-0405
Palm, R. Thoughts on the combined incineration of sludge and waste in grate furnaces. Brennstoff-Waerme-Kraft, 18(5):223-226, May 1966.

Present-day knowledge of sludge and waste incineration is qualitatively reviewed and some design criteria for a grate furnace are derived and illustrated. Transportation usually poses no problem except in the case of sludges with a water content between 65 percent and 82 percent and of sludges with a high albumen content, which makes them sticky. In the preheating stage of an incinerator, the water content must be lowered to a point where ignition is possible. Drying is essential if high temperatures must be reached to break down organic compounds which otherwise might cause odor problems. Particular attention must be paid to the corrosion problems which may lead to a rapid deterioration of boiler tubing and walls. In some cases auxiliary oil burners must be used. Various kinds of sludges like sewage sludges, sludges from food and metal finishing industries, etc., are briefly characterized as to their heat content, ignition properties, and other features. Slag may be used to bind certain minerals and metal oxides in a flame chamber with a temperature of 1,300 C. In three tables typical figures for the composition of waste, heat and gas release, heat concentration on the grate, etc., are listed. (Text-German)

66-0406
Possibilities for incinerating industrial wastes. Brennstoff-Waerme-Kraft, 18(5):256-259, May 1966.

Municipal incinerator plants usually accept only domestic wastes and reject industrial wastes unless similar in composition to domestic waste. A table is given listing the various kinds of industrial wastes accompanied by statements on their flammability. A second table shows the various possibilities of eliminating industrial wastes with comments on the danger they pose to groundwater when deposited, on the contents of toxic substances, and on water solubility. Since the heating value of industrial waste varies greatly, only small amounts at a time should be added to domestic waste for incineration. The great differences in composition among industrial wastes is demonstrated with an example from a chemical plant. A special problem is posed by incineration of polyvinyl chloride material. The chlorine and hydrogen chloride rapidly corrode the walls of the furnace. The slag remaining from waste incineration is not uniformly sintered because of the different melting behavior of the various types of waste. (Text-German)

66-0407
The purification and incinerating plant in Leverkusen, Germany. Chemie-Ingenieur-Technik, 38(8):910, Aug. 1966.

An incinerator and purification plant is being constructed in Leverkusen, Germany. The plant will be jointly owned and operated by the Farben Fabriken Bayer AG, the Wupperverband and the Landschaftsverband Rheinland. In the purification plant, municipal and industrial waste water will be mixed together in a ratio of 1:1 and cleaned in a mechanical biological process. The solid waste will be burned in a large rotating tube furnace. The heat obtained in the incineration will go to a boiler for steam production. The costs of the incinerator are estimated to amount to about 15 million DM. The furnace has been designed for a capacity of about 100 tons per day. (Text-German)

66-0408
Refuse incineration plant. Public Cleansing, 56(2):62-64, Feb. 1966.

A descriptive summary of 'automatic' furnace grates available in Great Britain is given. The 'Esslingen' System (West Germany) incorporates a stepped grate top fed by grab from a storage hopper. The grate is included and resembles a staircase. Refuse moves from the top of the grate to the bottom, being continuously turned over and moved forward by the rocking movement of the grate sections. Primary air enters at the bottom of the incline and auxiliary air is injected at suitable points under the steps. The 'Nichols' System (USA) also has an included grate with rocking elements similar to the Esslingen. However, the operating rams are placed outside the lower end of the incline and transmit their motion to the grate sections by means of rods. The 'Martin' System (West Germany) is another inclined grate. Here the grate sections have a reciprocating action, pushing upwards in the direction of the oncoming refuse. Each stroke of the grate section pushes a certain amount of live fuel under the 'green' fuel in front of it. The 'L' Stoker (Great Britain) is a travelling grate stoker designed to burn a wide variety of fuels. The grate is formed by a series of louvres or firebars, pivoted in holders arranged on tension chains. The 'Metalborg Sembler' System (West Germany) uses a rotary furnace consisting of a perforated stainless steel inverted cone which rotates slowly on an axis inclined at 45 degrees. The 'Morse Boulger' System (USA) has a conical furnace rotating about a vertical axis. The 'Volund' System (Denmark) is a combination of inclined grates and rotary kiln.

66-0409
Rogge, W. Incineration of oily sludges in rotating tube furnaces.
Brennstoff-Waerme-Kraft, 18(5):247-248, May 1966.

In Kassel, West Germany, an incinerator for burning the residues from a sewage plant was installed in the fall of 1964. The incinerator was erected directly above the sludge storage pit. An electrically driven basket wheel elevates the sludge to a funnel which leads into the flame chamber. Waste oil or other liquid waste material which did not go through the sewage plant is pumped into a container with a volume of about 200 liters. From there it flows directly to the funnel. Incineration in the rotating tube furnace (volume 1.3 cu m) is supplemented, if necessary, by a light oil burner. The number of revolutions of the tube can be continuously regulated between 0.3 and 2.0 rpm. The waste gases are completely combusted in an afterburner. In order to eliminate the dust from the stack gas in settling chambers, the gas must be cooled to 350 C. The cleaned gas is passed into the open air through a gas duct and a sheet steel chimney of about 10.5 m height. The incinerator burns about 100 kg of oily sludge per hr. It does not require continuous attendance. The plant has worked satisfactorily for more than a year. One photograph and one schematic drawing illustrate the construction of the incinerator. (Text-German)

66-0410
Rogus, C. A. An appraisal of refuse incineration in Western Europe. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.114-123.

The European incineration of community refuse has reached an advanced state of the art. Thirteen large modern incinerators in 7 European countries were visited. Three noteworthy operating plants are described with the objective of examining the observed improvements and new concepts and evaluating their applicability to American practice. All plants had over 1,000 tons per day capacity with furnaces of 200 tons per day capacity each or larger. The composition of Europe's refuse is compared with today's United States median and the incinerator types are discussed in terms of the effectiveness of combustion, exhaust gases discharge, and general cleanliness. The structure and amount of capital and operating costs is stated. The plant components are given detailed analysis (tipping, storage pits, oversized wastes handling units, crane buckets, cranes, furnaces, grates, residue systems) and attention is also paid to the cleaning of furnaces and the air pollution abatement. Several essentials for optimum incineration, typical of the European approach are listed.

66-0411
Rogus, C. A. Control of air pollution and waste heat recovery from incineration. Public Works, 97(6):100-105, June 1966.

European air pollution abatement equipment, subsidence chambers, baffled collectors, and scrubbers require no pre-cooling of the raw gases. Centrifugal collectors, cloth-type filters and electrostatic precipitators require cooling gases to 400 to 500 F to avoid corrosion and to reduce volume. Particulates, volatiles, and noxious gases are destroyed within the furnace combustion chamber. Entrainment of dust and particulate matter is avoided; excess air is limited to 25 to 50 percent. The waste heat recovery, the total heat energy available from American refuse, is estimated to range between 3,400 to 5,500 Btu per lb. In incineration about 45 percent of this latent heat is required for supporting the burning process itself, another 10 percent is dissipated through the furnace and duct enclosures and in the hot residue, and the remaining 45 percent is usually wasted out the exhaust stack. Most European plants find waste heat recovery economical because of: development of more incinerators to handle low caloried refuse; more effective heat recovery systems; recognition of alleviation of air pollution; and unavailability of economically competitive fossil fuels. An European incinerator can produce up to 1.8 lb of steam per 1 lb of refuse. For American applications it would appear that steam recovery may be practical and sound economically but only for space heating of nearby sites. Only the end products from incineration are reclaimed on the Continent. Residues are demetalized, crushed, and screened. The salvaged tin metals are sold to steel mills. Clean residues are used for concrete and cinder block work, and roadbed construction.

66-0412

Rogus, C. A. European developments in refuse incineration. Public Works, 97(5):113-117, May 1966.

European incineration uses the following principles: non-violent continuous mechanical agitation and intermixing of refuse on improved grates; maintaining uniform high furnace temperatures (1800 to 2000 F) speeding up burning; holding the air of combustion close to the theoretical optimum of about 4 lb of air per lb of average refuse; high-vaulted furnace chambers; replacement of costly refractories with water cooled walls permitting higher burning temperatures; direct downward removal of grate siftings. Their incinerators utilize the generated heat for steam and power production. Combustion efficiencies range above 90 percent. Emissions are well within their 0.20 lb of particulates per 1,000 lb of flue gas corrected to 50 percent excess air. Cleanliness and freedom from dust and odors were superior. Average capital costs were $10,000. Operating costs are 10 to 15 percent lower. Capacities of storage pits are generally much higher. Overlarge refuse is processed through specially designed impact crushers or multiple type shears. One-third of the crane buckets observed were of conventional clam shell type but equipped with large tines. Others were of polyp. The use of three cranes is required. The large rectangular furnaces are fully enclosed in a steel sheet envelope, pierced only with inspection and instrument openings, thereby providing maximum air and dust tightness. The most meritorious systems are Drum grate, Martin system, and Von Roll system. Hot residue is subjected to a short quenching cycle and then substantially dewatered by being pushed or dragged up a short inclined surface. The relatively dry residue drops onto rubber or steel conveyors for rapid transport into storage hoppers. Many European plants have successfully used electrostatic precipitators and ancillary equipment for the removal of particulates.

66-0413

Rubbish incinerator for continuous operation. Engineering, 201(5224):1053, June 3, 1966.

The new Heenan-Nichols continuous grate incinerator is described. A prototype unit is being built for demonstration in Birmingham. Some of the design details, which were modified to suit the peculiarities of British refuse, include alteration of the teeth arrangement in the grate and adjustment of the clearance in the moving parts of the grate. The grate is built in three steps and feed is supplied by conveyor, although in the new standard units there will be a return to the grab system of refuse feeding. Ash falls from the grate into hoppers and is deposited into a water trough containing a scraper conveyor which also picks up the final discharge of clinker and transports the material to a loading point. The Birmingham installation will handle about 50 tons of refuse in an 8-hr day. Among the advantages claimed for the Heenan-Nichols grate are low labor requirement, space saving, and less wear on the furnace brickwork. However, maintenance and running costs will be higher than those for a standard incinerator, and it is not possible to burn bulky items.

66-0414

Stabenow, G. Survey of European experience with high pressure boiler operation burning wastes and fuel. In Proceedings; 1966 National Incinerator Conference, New York, May 1-4, 1966. American Society of Mechanical Engineers. p.144-160.

A recent survey of European practice indicates that the all-refractory furnace is becoming obsolete and is being replaced with a water-cooled furnace, convector and economizer. The volume of the waste gases for this type of incinerator is only one fifth of that of the all-refractory furnace with efficient dust collectors. The principles, stoker design, burning rates, boiler design, and the high efficiency dust collection associated with such installations are discussed. A detailed description of the design criteria that had to be established to meet the increasing demand for air, soil and water-pollution control is given and several mandatory limitations are listed. These limitations pertain to the reduction in dust and noxious gas emissions, to temperature requirements regarding ashes, clinkers and all nonburnables, the precentage of putrescible matter in the cinders and ashes, water consumption for cooling ash and gas, and moisture in the stack gases. Data are given on nine European and two Brazilian plants of European design and the heat utilization is indicated.

INDUSTRIAL WASTES

66-0415
Activated sludge plant replaces primary-lagoon system. Public Works, 97(11):118, 1966.

When a primary treatment plant was built in 1958 for Abilene, Texas, numerous complaints were filed protesting odors, seepage, and mosquito harborage. Part of the problem was the high BOD of the influents. Following the adoption of an industrial city ordinance, the daily average influent BOD was lowered from 650 to 320 mg per liter. Plans were also made for a new 12-mgd plant which could be operated either as a conventional activated sludge plant or by the contact stabilization process. The plant includes Link-Belt Circuline sludge collectors, screw thickener in the aerobic digester, and a 40-mesh effluent screen for that portion used for inplant purposes. Effluent BOD ranges from 1 to 5 mg per liter after chlorination.

66-0416
Anaerobic sludge digestion--MOP 16. Journal of the Water Pollution Control Federation, 38 (10):1683-1702, 1966.

There is no single procedure or method in anaerobic digestion of sewage solids. The reasons for using anaerobic digestion include its efficiency, effectiveness, and economy. It is considered to be a procedure in which anaerobic and facultative microorganisms utilize the oxygen bound within the complex molecules of sewage solids for their life processes. Two groups of organisms are working concurrently. A saprophytic group liquifies and hydrolyzes the solids in an acid stage. A gas-producing group breaks down the volatile acids in an alkaline stage. The best digestion is achieved when the two distinct reactions are maximized within a single process. The digestor is the most important facility in anaerobic sludge digestion. Each operator should study the the design of his own facility and develop an operational manual based on its limits and requirements. Volatile acid content, total and volatile solids present, pH and alkalinity, gas production, temperature, tank profiles, sludge densities, control of pumping, and loading records are all mechanical control parameters that digestor operators in specific plants now use. The operator's funds are so limited that new changes in digestor design mean little to him. The parameters of control and the tests of digestor effectiveness have proven relatively satisfactory in many facilities.

66-0417
Anaerobic sludge digestion--MOP 16. Journal of the Water Pollution Control Federation, 38(11):1840-1858, 1966.

The characteristics of the raw sludge feed affect very directly the biological-biochemical reaction complex called digestion. Because of this direct relationship, it was concluded that close examination of the physical and chemical characteristics of raw sludge, of sludge collection practices, and of methods of addition needed to be made. It was found that the raw sludge should be concentrated before being fed to the digestor. Grit and sand, screenings, scum, and grease, all present problems during digestion and methods to combat them should be employed. The pumps used in the treatment plant should be specific for that operation. The proper nutrients should be present in the sludge and added if necessary. Materials which are toxic should be chemically removed. Continuous feeding was found to be theoretically the best system if the raw sludge is heated to its optimum temperature. Basic principles of microbiology and biochemistry should be considered by design engineers and plant operators rather than using set formulas or trial and error methods. Manufacturers offering digestion equipment should have reprints of papers referring to work on their equipment. Loading rates are termed 'standard rate' or 'high rate'. 'Standard rate' is between about 0.04 and 0.10 lb VS per day per cu ft. 'High rate' covers a range of 0.15 to 0.40 lb VS per day per cu ft. Since loading must be controlled between a maximum and minimum level, the natural process is touchy and relatively inflexible.

66-0418
Anaerobic sludge digestion--MOP 16.
Journal of the Water Pollution Control Federation, 38(12):1925-1943, 1966.

The startup of a new digestor represents the most 'normal' sour condition. The best way to start a digestor is by using seed sludge from a unit which is already operating satisfactorily. Raw sludge allowed to digest with no seed and no aid other than heating requires about 85 days until normal operation can proceed. The use of high calcium or magnesium lime to control pH aids starting. Two starting processes exist. The long-term 'natural' process and the accelerated process both implement the growth of bacteria and prevent extreme acid conditions and toxic metabolic products. Digestor failure can be due to low pH, low alkalinity, overloading, high volatile acids, toxic industrial wastes, toxic metals, too much lime, temperature changes, poor mixing, or toxic ion concentration. When digestion problems develop, it is recommended that the major effort be expended on proven methods of analysis and recovery. Additives do not always have beneficial effects. Digestor cleaning is an unsolved problem. Grit removal chambers are a necessity for efficient operation. Adequate mixing is the best method to prevent deposition and control scum. Design of digestion tanks aid grit and scum removal. Treatment and cleaning of the digestion tank is the essential factor. In the field of sludge digestion, future planners must be concerned with the total environment rather than only the water pollution aspect as in the past.

66-0419
Analysis of combined collection systems.
Public Works, 97(6):134-136, 1966.

The article, 'How to Analyze Combined Sewage and Stormwater Collection Systems,' by Richard H. Stanley, Water & Wastes Engineering, April 1966, is summarized. A proposed method of analysis of combined sewer overflow systems follows this sequence: (1) a general examination is made, based on field inspection and system maps; (2) drainage areas for each overflow structure are determined and measured; (3) the physical configuration of each overflow structure is field-measured and the hydraulics of each structure analyzed; (4) the sewers downstream and immediately upstream of each overflow structure are investigated for flow limitations; (5) the average dry weather flow from the system is determined from records or by field measurement; (6) the average dry weather flow at each overflow structure is determined by allocation of total system dry weather flow; (7) average dry weather BOD is obtained from plant records or sampling; (8) rainfall records for the area are obtained; (9) from field observation of the drainage areas tributary to each overflow structure, an estimate is made of runoff; and (10) if necessary, the BOD content of the storm water is estimated. The advantages of this method of analysis over gauging and sampling are: (1) it is easily adapted to reflect changes in system and loading conditions; (2) future loadings can be calculated readily; (3) the cost is substantially less; and (4) the time required is reduced considerably.

66-0420
Andera, M. J., G. R. Ross, and H. A. Brandeland. Waste treatment at the Rath Packing Company. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.52-55.

In the late 30's the Rath Packing Company decided to direct their effluent to the municipal disposal plant and proceeded to erect pre-treatment facilities within the company. As years progressed, the facilities appeared to be inadequate and a concentrated effort was made to reduce hydraulic and BOD loadings with limited capital expenditures. Steps taken in solving the problem included: analysis of waste water, construction of an additional basin to handle heavily contaminated waters, conduction of a water use survey in the plant, involvement of the supervisors in the offending areas, and use of sound laboratory facilities.

Laboratory records showed that a 1.1 to 1.0 relationship between volatile solids and BOD exists. Future plans will include elimination of all wet rendering and lagooning of settled water.

66-0421
Anderson, D. R., W. D. Bishop, and H. F. Ludwig. Percolation of citrus wastes through soil. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121 p.892-901.

The operation of one of the world's largest citrus processing plants, Lemon Products Division of Corona, California, is described. Since ponding of the total waste effluent was not satisfactory due to odor nuisances, disposal of the effluent by irrigation of nearby agricultural lands was instituted. A monitoring technique was developed for measuring the effectiveness of the soil in removing certain waste constituents. Experience with waste spreading has shown that stabilization of removed material effectively occurs without odor production. This indicates aerobic conditions in the soil to depths of at least 3 ft when spreading is occurring. Spreading by the back-furrow method allows air effectively to enter through the tops of numerous dikes and to help satisfy the high oxygen demand of the removed materials. The trenches in which settlement and clogging occur remain clogged, but air can reach below the clogged surface so that very little tendency toward anaerobism arises.

66-0422
Applying sewage sludge to land. Compost Science, 7(2):21-22, 1966.

A sewage works near Glasgow, Scotland, has developed a pumping apparatus for applying liquid digested sludge to farmland. Previously digested sludge was disposed of at sea. Improvements in grazing pasture save the community $30,000 per year. The 2,000 gal tanker is filled in 7 minutes by centrifugal force. The dose rate is 6,000 gal per acre with a spray gun. Each tanker can distribute between 10,000 and 14,000 gal per day. There are three tankers. Chicago plans to pump treated sludge into long-distance, underground pipelines. Presently the district prepares and sells the city's treated waste as heat-dried, activated sludge to which nutrients are added. The product is sold as fertilizer. The district will need 30,000 acres of farmland to accomodate the city's daily 600-ton sludge loads. Dr. Edward Keller, Jr., is working on a futurist sewage processing system that would use the sun's energy to power biological conversion of human wastes into useful nutrients. A pamphlet describing the pumping apparatus may be obtained by writing to Mr. Templeton, Allers Sewage Works, Calderwood, East Kilbridge, Scotland.

66-0423
Balden, A. R. Business facets of the solid-wastes problem that must be integrated into a management-science approach. In Solid Wastes Management; Proceedings; National Conference, Davis, University of California, Apr. 4-5, 1966. p.135-143.

Treatment of industrial waste waters is reviewed. Detailed consideration is given to the ultimate disposal requirements and procedures of soluble oils and oil formulations, and of paint waste sludge. The concept of ultimate disposal is defined and five methods of achieving ultimate disposal are listed: (1) subsurface storage in cavities or pervious strata; (2) conversion of wastes to innocuous compounds; (3) surface storage; (4) disposal of the unconfined wastes into the ocean; (5) conversion to useful products. Special attention is given to the methods of incineration. Among the variables being evaluated are: (1) the point of mixing the waste materials with the auxiliary fuel; (2) the economics of flame versus fluidized bed incineration; and (3) the nature of the gaseous exhaust.

66-0424
Benger, M. The disposal of liquid and solid effluents from oil refineries. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.769-767.

Conditions as they exist in the United Kingdom and Western Europe in regard to disposal of oil refinery wastes are reviewed. Solids or semi-solid wastes likely to be encountered are sludges from primary separators, flocculators or biological plants; spent clays from lubricating oil treatment, and oily earth from occasional accidental spillages. The only satisfactory way of dealing with the sludges is either to filter or centrifuge them and then burn them. Spent clay is an objectionable waste, but of diminishing importance as catalytic processes replace clay treatment of lubricating oils. Notwithstanding the expected increase in total refining capacity, effluent discharge should actually decrease overall, as obsolete and uneconomic processes in the older refineries are replaced by new ones.

66-0425

Billings, C. H. Activated sludge treatment. In The 1966 sewerage manual and catalog file. Ridgewood, N. J., Public Works Journal Corporation, 1966. p.147-159.

Aeration serves at least 3 functions: mixing effluent from primary treatment with returned activated sludge, keeping sludge in suspension, and supplying oxygen required in the biological oxidation process. Diffusers, air filters, blowers, and compressors used in pressure aeration and mechanical aerators of the paddle and vertical draft tube types are described. Anti-foaming agents may be applied in the aeration tanks of activated sludge plants to inhibit the formation of foam caused by the use of synthetic detergents. Several combined aerator and clarifier systems are examined. Modifications of the activated sludge treatment include: providing primary settling followed by a shorter than conventional aeration period; with primary settling optional, providing a 'mixingaeration' period followed by secondary settling and reaeration; providing 24 hr aeration followed by final settling; providing rapid and thorough mixing of all the sludge with the raw sewage plus a shorter-than-24 hr aeration period. Under favorable conditions of soil and climate, sewage can be treated by stabilization basins or oxidation ponds. The loading of oxidation ponds can be increased by installing aeration devices in them.

66-0426

Billings, C. H. Disposal of sludge. In The 1966 sewerage manual and catalog file. Ridgewood, N. J., Public Works Journal Corporation, 1966. p.175-198.

Ultimate disposal of the solids from anaerobic digestion of sludge generally requires dewatering as an initial step. In air drying, the sludge is drawn onto an underdrained bed of sand, crushed anthracite coal or similar course media. For removing the dried sludge from the drying beds, a number of mechanical aids have been developed such as buckets carried by monorails, track-type tractors, and conveyor systems. A vacuum filter installation consists of a sludge pump or bucket elevator, chemical feeders, sludge conditioning tanks, vacuum filter, vacuum receiving tanks, vacuum pump, filtrate pump, filter cake conveyor and sludge cake hopper. Chemicals are added to sludge before vacuum filtration to facilitate separation of solids and the liquid. Further drying of filter cake is obtained by the use of heat. Thickeners, presses, and centrifuges have found application in dewatering sludge. Air dried sludge is usually left on the drying beds until spadable, and is then carried to dumps, with or without further drying. Incinerating sewage sludge that has been partly dewatered is possible in a multiple hearth furnace. Other disposal techniques include wet oxidation, the Atomized Suspension Technique, and the Fluo Solids system.

66-0427

Billings, C. H. Sludge digestion and gas utilization. In The 1966 sewerage manual and catalog file. Ridgewood, N. J., Public Works Journal Corporation, 1966. p.160-174.

Digestion tanks have been constructed of concrete up to 100 ft in diameter with side water depth usually 20 ft. Insulating materials have been used on the concrete exterior. Fixed covers or floating covers, which rise and fall with the liquid contents, are utilized. Provision must be made for introducing fresh sludge and withdrawing that digested, also for removing the supernatant liquid and for collecting and disposing of the gas produced. Generally from 2 to 5 cu ft per capita must be provided in heated tanks--more in unheated tanks. Aids to digestion are: heat; regular frequent additions of fresh sludge; breaking up and submersion of scum; and maintenance of pH between 6.9 and 7.6. A temperature above 70--preferably 80 to 100 F--is necessary for rapid digestion. Gas formed in digestion tanks has a Btu value of about 600 to 700 and can be used as a source of heat by burning it in gas boilers, or as source of heat by burning it in gas boilers, or as a source of power by using it in gas boilers, or as a source of power by using it in gas engines. Gas safety devices include flame traps, drip traps, pressure relief valves, pressure gauges, and accumulators. The power available in the sewage gas from a given plant depends upon the pounds per day of volatile solids removed from the sewage treated.

66-0428
Bloodgood, T. W. Treatment of animal wastes at the Greenfield Laboratories of Eli Lilly & Company. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.56-61.

Descriptions of five separate waste treatment plants located throughout Greenfield Laboratories are included. Although these facilities treat all wastes at the plant, emphasis is placed on their use in the treatment of wastes generated by the thousands of animals used in the various production and research programs. This report on existing facilities is based on maintenance and operational experiences. Test results from Plant 226 are shown in tabular form since it is felt that a performance attained at this plant is a goal for the operation of other waste treatment plants at Greenfield.

66-0429
Bonomo, L. Purification process of the industrial wastes of distilleries of beet molasses. Ingegneria Sanitaria, 14(3):101-123, 1966.

The purification of distillate from the alcohol fermentation of beet molasses is discussed. The laboratory procedure of distillation is briefly reviewed with possible application to urban waste disposal in municipal plants. Diagrams are presented for a pilot plant which will treat distillery wastes in two stages, involving digestion, recirculation cycles, and final sedimentation in percolation beds. Values in parts per million are tabulated for distillery effluents, indicating total mineral and organic solids, suspended particles, BOD, and organic acids. Methods are outlined for treatment by: anaerobic digestion, aerobic biological treatment, thermal treatment (incineration), mechanicophysical treatment (sedimentation, centrifuging, filtering), electrochemical treatment (electrodialysis), and agricultural land treatment. Irrigation and lagoon treatment are cited as the methods most generally used today. The lagoon method is simple and safe, but entails the disadvantages of noxious odors and insect breeding grounds; it cannot be used near densely populated areas. (Text-Italian)

66-0430
Breitling, V. Waste water, waste, waste gas. Wasser und Abwasser, 107(34):961, 1966.

A book edited by D. Behrens and K. Fischbeck (Abwasser, Abfall, Abgas, Verlag Chemie, Weinheim) is reviewed. It contains 17 lectures delivered during the 14th Exhibition of Chemical Apparatus and during the European Meeting on Chemical Technology, held in Frankfurt in 1964. Eleven of the papers deal with industrial waste water, and the remainder with air pollution. The recovery of metal salts, proteins, and radioactive substances is emphasized. A few titles are: Treatment of sludge concentrates and dehydrates; The application of ion exchange; Biological treatment in the purification and production of proteins; Oil identification and separation from emulsions; Removal of radioactive impurities; and Recovery of valuable metallic salts. The Bayer double contact treatment and the catalytic afterburning of waste gases are detailed. An experience with a waste incinerator in Ludwigshafen is described. (Text-German)

66-0431
Burke, T., and M. T. Dajani. Organic polymers in the treatment of industrial wastes. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.303-313.

The factors influencing coagulation and flocculation of colloidal systems with chemicals are discussed. The use of polymer flocculants to improve the removal and dewatering of waste solids is described for such diverse industrial categories as: automotive assembly plants, steel mills, bituminous coal preparation plants, soap manufacturers, and locomotive assembly plants. For each type of plant, the waste treatment system, its problems, and a corrective program are outlined. Polymer flocculants and emulsion breaking chemicals should be considered only where they are applicable and economical. Relatively simple laboratory or pilot tests can be utilized to determine the feasibility of using them.

66-0432
Capestany, G. J., and D. A. Carlson. Utilization of resistant proteins by

activated sludge. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.943-952.

The purpose of this study was to gain insight into the biochemical, microbial, and physical behavior of an activated sludge culture when presented with a truly complex protein molecule. Different methods for dissolving hair were investigated and micro-biological behavior was analyzed in batch and continuous activated sludge cultures when dissolved keratin was the sole carbon and energy source. After a series of chemical solvents was tested, NaOH was found to be the most effective solvent for hair at concentrations between 0.5N and 1N. The methods developed provide a good, feasible means of utilizing keratins biologically.

66-0433

Carpenter, E. F., Redwood bark for sewage treatment. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 92(SA1):11-18, 1966.

A small 'package plant' sewage disposal treatment is described. The contact or holding tank is filled with floating short fibers of redwood bark. Microscopic life, including aerobic bacteria, live on the suspended solids in the sewage. Effluent from the holding tank is pumped and distributed into hanging fibers which are suspended vertically over the contact chamber. The final treatment of dissolved solids and colloids occurs on these hanging fibers, which present as much as 100 times the surface area per cu ft as rock used in a high-rate trickling filter. An interesting feature is the requirement for live fish in the lower compartment. From three to 12 catfish or other fish have been placed in the tanks. In all cases, the fish thrive and maintain a balance between the numbers of paramecium and tiny crustacians and the requirements for microbiological activity in the redwood fibers. Tabulated test data and data from treatment in a single family unit indicate that raw sewage is somewhat weaker than normally expected and that a high degree of treatment can be expected from such a unit. The process has been most effectively used for waste disposal from single family residences, trailer courts, and resorts. While operating, the plant creates no odor problem. Aerobic conditions are maintained by a high circulation rate (four times the daily flow) and adequate detention time, with 24-hr retention of average daily flows.

66-0434

Cearlock, D. B. Transport analysis--basic predictive approach of the movement of pollutants through soil. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.516-526.

The need to maintain control over waste discharge to the environment via the groundwater route has required the development of the accurate methods for flow system analysis and waste transport evaluation. Fluid movement and pollutant reactions were studied in the laboratory as two independent effects with later integration of the experimental results and determination of experimental coefficients for field-scale applications through the use of the transport equation. The fluid movement component of the transport equation groups together all mechanisms that transport the pollutants through the soil: convection, dispersion and diffusion. The reaction component includes all reactions that occur between the pollutant and its environment--biological, chemical, or physical.

66-0435

Committee of VTG/Dechema for industrial waste. Brennstoff-Waerme-Kraft, 18(5):248, 1966.

The Verfahrenstechnische Gesellschaft (professional group for manufacturing technology) of the Verein Deutscher Ingenieure (Association of German Engineers) and the Deutsche Gesellschaft fur chemisches Apparatewesen (Dechema, association for chemical apparatus) formed a committee for industrial waste in Stuttgart on Feb. 11, 1966. Chairman is R. Quack of the Technical University of Stuttgart. It is planned to hold two colloquia annually. Three work groups will deal with the following topics: (1) corrosion by stack gases from waste incinerators, (2) cutting, mixing and loading of waste, (3) analysis of waste deposits, in particular contamination of water supplies. (Text-German)

66-0436

Comsuming problem. Engineering News-Record, 176(14):149-150, 1966.

A new solution to disposal of paunch manure for meat packers is described. The 140 million steers slaughtered annually in the United States produce about 4.2 million tons of paunch manure, with additional contributions from 7.6 million calves and 15 million sheep. The old disposal method of river dumping has been halted by federal water pollution control officials. An investigation of efficient ways of disposing of paunch manure by Farm Materials Process, Inc. suggested that it be fed to cattle. Analysis of paunch manure showed that on a dry basis it is composed of 16 percent protein, 3 percent fat and 69 percent carbohydrate. A heated-air sterilizing process was designed that removes the moisture and bacteria and prevents production of offensive odors. The company experimented with the product, feeding it first to 4 head and then to 850 head of cattle and found that the animals not only eat the processed paunch manure but gain weight on it. The product costs much less than regular cattle feed.

66-0437

Cotton waste industry facing big challenge. Waste Trade World, 108(14):5, 1966.

Remarks made at the annual dinner of the British Cotton Waste Association Ltd. held on March 25, 1966, are reported. Mr. J. Clifford Whittaker, the principal guest, described the great changes which have taken place in the machines now used in the modern cotton spinning and weaving mill. In order to use waste and by-products from these machines, technical progress in cotton waste mills is necessary and would require considerable financial expenditure. He suggested that cotton waste consumers and merchants consider amalgamations strong enough to carry out a modernization program.

66-0438

Crawford, G. B., and N. G. McDonald. Sludge elutriation, filtration, and incineration-drying at Toronto. Journal of the Water Pollution Control Federation, 38(2):271-280, 1966.

The new facilities of Toronto's Main Treatment Plant are described in which digested mixed primary and waste activated sludge is elutriated, vacuum-filtered at rates of 5 to 8 psf per hr and then incinerated and dried. The new plant was required because the daily average flows were 70 percent above the original design flows. The new elutriation tanks have a capacity for 240 mgd average flow rate (present average flow is 170 mgd). The elutriated sludge is conditioned with ferric chloride and lime before vacuum filtration. A table is given of the results of the coil filter acceptance test with elutriated digested primary sludge and waste activated sludge. The required filter yield of solids of 4 psf per hr was well exceeded and the cake moisture content and chemical use were well within the guarantee limits. Another table gives a resume of the March to August operations for 1955, 1962, 1963, 1964, and 1965. The 1955 results with digested primary sludge show successful operation with dense elutriated sludge. The difficulties when waste activated sludge was added to the digestion and sludge disposal systems show up in the values for filter yield and conditioning chemicals in the 1962 and 1963 statistics. Because of the present shortage of incinerator capacity, it is not possible to process all the digested sludge through elutriation. The final test of the adequacy of the design may develop when the incineration shortage is corrected and the plant flows are near the design rates.

66-0439

Deb, P. K., et al. Removal of COD from wastewater by fly ash. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.848-860.

A study was made to compare the removal of organic refractories from sewage treatment plant secondary effluent using activated carbon and fly ash. A laboratory study was conducted to determine the effect of several parameters that control adsorption. The operating characteristics of a continuous flow pilot plant were observed. Findings demonstrate the capacity of fly ash to remove refractory materials from wastewater in both batch and continuous flow systems. The major part of the removal of COD occurs during the first 10 minutes and further extension of the mixing time results in insignificant removal of COD. The addition of a small percentage of activated carbon in the fly ash enchances the adsorptive capacity of the mixture considerably. The percent COD removal remained relatively constant at initial COD's over 150 mg per liter. The COD removal became independent of fly ash concentration above 3,000 mg per liter of fly ash.

66-0440

Dietz, J. C., P. W. Clinebell, and A. L. Strub. Anaerobic pretreatment of packing house wastes. In Proceedings; Fifth Annual Sanitary and Water Resources Engineering Conference, Nashville, Tenn., June 2-3, 1966. Technical Report No. 9. Vanderbilt University, Department of Civil Engineering. p.65-68.

The three types of operations which generate wastes commonly referred to as meat industry wastes are described. The history of the Union City, Tennessee, waste treatment problem is outlined. The anaerobic contact process was considered as a solution for pre-treatment of the packing house wastes. Excellent results were obtained from the pilot anaerobic contact study. It was necessary to construct a pilot lagoon at the Union City, Tennessee, municipal sewage treatment plant to determine the treatability and loading parameters of mixed slaughter and meat packing plant wastes received at the municipal plant. A full scale lagoon with a capacity of a 30,000 cu ft was constructed in August 1965. Data on the operation of the city waste water treatment plant indicate the effectiveness of pre-treatment of the packing house wastes and the ability of the City's waste water activated sludge treatment plant to handle the anaerobic lagoon effluent with satisfactory results. The anaerobic contact process and anaerobic lagoons are considered the most economical methods presently available for the pre-treatment of packing house wastes. Although the construction costs of the anaerobic contact process are higher than for the anaerobic lagoon process, infinitely more control can be exercised in using the contact process.

66-0441

Elimination of industrial waste. Chemie-Ingenieur-Technick, 38(5):588-589, 1966.

The Institute for Water and Air Pollution Control held a meeting on Dec. 1, 1965, in Cologne, Germany, which was repeated on Feb. 2, 1966, in Stuttgart. Several papers were presented, dealing with the elimination of industrial wastes. It was pointed out that industrial wastes composed mainly of inorganic components can neither be incinerated nor composted. The only possible way to eliminate them is to dump them, but prior to dumping a possible re-use of the waste products should be taken into consideration. The composition of industrial waste, which is composed mainly of organic substances, must first be analyzed to decide which method of elimination is most suitable. Material of biological origin is especially suited for composting. An incineration of the waste is advisable when a considerable reduction in volume is primarily sought and when the waste consists of toxic substances, halide-containing plastic material, etc. The incineration residues (ash) are generally discharged from the furnace in a wet stage to avoid afterglowing. (Text-German)

66-0442

Factories told to handle own waste. Refuse Removal Journal, 9(3):40, 1966.

The Mexico City sanitation department recently ordered all factories to take their own refuse to disposal sites or take whatever measures they find convenient. Authorities estimate that at least one-third of the capital city's refuse packers are tied up by the city's industries. Companies failing to comply will be fined. Daily refuse collection in this city of 4 million is about 4,000 tons.

66-0443

Freyschuss, S. Pulp mill waste disposal at specific installations in Sweden. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.791-798.

All of the large pulp and paper mills in Sweden are situated either along the sea coast or near the big lakes. Investigations were made in the cases of a sulphate mill and a sulphite mill before they could obtain permission to build. The court permission for the mills dictated that all waste water containing fibers should pass into a sedimentation tank before being distributed in the sea through a pipeline 4,000 m in length. The prognosis of the BOD for the sulphite mill, which was 70 kg per ton of pulp, was on the average too low considering that half the pulp production is from hard wood. The mills also had to mix all condensates with chlorine water from the bleaching process to reduce the toxic effects of sulphides and mercaptans. To check the theoretical calculation for the dilution of the waste water in the sea, an investigation was carried out using a radioactive tracer technique. The additional cost for separating the waste water, for the sedimentation plant and for the pipeline, has amounted to 8 percent of the total investment in the mill cost.

66-0444

Gaudy, A. F., and P. Krishnan. Mechanism and kinetics of substrate utilization at high biological solids concentrations. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.495-510.

Studies were carried out at high biological solids concentrations in order to arrive at a more complete understanding of all types of activated sludge processes. Sludges were developed on glucose and sorbitol using the 24-hr batch feeding cycle. The analyses employed were: substrate COD, biological solids (membrane filter technique), and protein and carbohydrate content of the cells. The glucose carbon source was measured by either the anthrone or glucostat test, and sorbitol by the periodate test. The results offer no evidence for adsorption as a primary mechanism of substrate removal, but do offer additional evidence for the purely biochemical mechanism. The results offer further proof of the hypothesis for the different mechanisms of substrate removal for low and high solid systems and offer a biochemical explanation for the occurence of linear sludge accumulation and substrate removal and the change in per cent of the theoretical oxygen demand exerted at the time of substrate removal at higher solids.

66-0445

Get the most out of wood waste fuels. Modern Power and Engineering, 60(7):78-81, 1966.

Waste wood products should be used as fuel to produce steam. Five waste wood-burning methods are discussed: (1) pile burning; (2) inclined grates; (3) spreader stoker firing onto grates; (4) suspension burning; and (5) cyclone furnaces. An advantage of the pile burning method is that most of the fuel is burned in a quiescent state and carryover is at a minimum. In the inclined grates method, fuel size is not of significant importance and wet fuel can be adequately dried. Spreader stoker firing onto grates allows a thin fuel bed on the grate, which facilitates good control of the heat output under varying loads. Suspension burning is a modification of spreader stoker firing, where fuel is introduced high in the furnace, thereby achieving suitable air admission and turbulence. In cyclone furnaces up to 40 percent of the heat input from the bark can be achieved, and they have a low fly ash carryover. Seven other factors which have an important bearing on the burning of wood waste fuel are discussed: (1) overfire air; (2) furnace; (3) superheaters and convection banks; (4) heat recovery equipment; (5) dust collectors; (6) cinder recovery systems; and (7) fans. A method for automating combustion control in a wood firing system is outlined.

66-0446

Harding, C. I. Source reduction in the pulping industry. In Proceedings; Fifth Annual Sanitary and Water Resources Engineering Conference, Nashville, Tenn., June 2-3, 1966. Technical Report No. 9. Vanderbilt University, Department of Civil Engineering. p.192-204.

The draft process of wood pulping has been gaining rapidly in popularity because it can use virtually any tree species or mill residue; it is a high yield process. Tall oil and turpentine by-products are obtained, and waste disposal is simpler than for the sulfite process. Most of the air pollution problems associated with pulping result from the use of the kraft process. Data on atmospheric emmissions from kraft mills are tabulated. The various process steps in the kraft pulping and recovery system are reviewed in order to characterize emissions from each and outline control techniques available. Methods of reducing the formation of smelly sulfur compounds are: reducing the sulfidity of the cooking liquor in the digester, rapid cook at high temperature, adjusting the alkali content of the liquor to raise the pH at the end of the cook from 10 to 12, vapor phase cooking, and cooking with non-sulfur compounds. Current research efforts are pointing the way to better control of mill emissions by reducing the quantity of pollutants formed during the pulping and recovery process.

66-0447

Hernandez, J. W., et al. Treatment of shipboard wastes. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.880-891.

Convention naval shipboard sewage systems are reviewed briefly. Since shipping activity on inland and coastal water is a source of pollution, the traditional practice of discharging raw soil wastes directly overboard must be discontinued. An inter-agency committee within the Federal Government has proposed shipboard treatment requirements. A shipboard survey to determine the quantities of human wastes produced per capita and the physical, biological, and chemical properties, was conducted to provide design data for a treatment system. The data indicates that between 10 and 20 gpd are produced per capita on ships following a normal work day routine and a maximum of twice this amount can be expected if operation is on an around-the-clock basis. The sewage produced contains an average of 236 mg per liter of suspended solids and an average BOD of 102 mg per liter. Evaluation of a macerator-chlorinator established the feasibility of using a single unit for multiple fixtures. A substantially coliform fee effluent can be expected if available chlorine is maintained above 1,300 mg per liter per flush.

66-0448

Hunter, J. V., E. J. Genetelli, and M. E. Gilwood. Temperature and retention time relationships in the activated sludge process. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.953-963.

Using a synthetic waste, the temperature range from 4 to 55 C was investigated to observe the effect of temperature on the behavior of the system and establish how high the temperature could be raised before process efficiency deteriorated and sludge accumulation increased. The study was made using a batch operated activated sludge system with a 16 hr retention time. The synthetic waste was designed to have a high suspended matter and BOD concentration. The general effect of temperatures on the behavior of the system studied was toward better efficiencies and suspended matter destruction at the higher temperatures, with a reversal occurring after 45 C. The general effect of retention time on the efficiency and suspended matter destruction was similar. Although there was no uniform trend, the lowest sludge DNA contents occurred at the lowest temperatures. Sludge DNA contents were a better indication of sludge bulking than general appearance of microscopic examination of the sludge. As the temperature increased, there was less filamentous growth and an increased protozoan and rotifer population.

66-0449

Kettering abattoir has vertical on-line beef dressing. Surveyor and Municipal Engineer, 128(3871):26-27, 1966.

Since much of the meat from the new Kettering Borough Council's abattoir is to be exported, very strict hygienic precautions are required to permit the meat to be shipped to any country in Europe. The animal touches the floor only as it leaves the stunning floor where it is immediately hoisted to the bleeding rail and remains suspended through all the subsequent dressing operations. The dressing is more hygienic, the meat and pelts are of better quality than from trolley dressing, and the work is less arduous. There are three sections: the covered lairage where enough animals are housed for a day's kill; the central slaughter hall with adjacent stunning pens; and special rooms for processing gut, fat, and hides, along with cold rooms for the storage of finished carcasses. The capacity of the setup is 15 cattle units, 60 pigs, and 60 sheep an hour. The interior walls of the cavity brickwork are coated with epoxy resin paints to make cleaning easier and the floors with a nonslip granular surface. The wall alongside the cattle stunning pen is protected by a large stainless steel plate. Pressurized cold water is supplied through outlets in the main building for cleaning. Cattle enter the slaughter hall direct from the lairages, passing through a footwash and sprays. The three dressing lines for cattle, sheep, and pigs run transversely across the slaughter hall toward separate rooms so that when the fat, gut, and skins are removed they need only be transported a minimum distance. The dressed carcasses pass directly to a precooling area for inspection and then to the cold room.

66-0450

Manchester's new abattoir and meat market. Surveyor and Municipal Engineer, 128(3865): 13-14, 1966.

The £3,750,000 meat production and distribution center for the City of Manchester Market's Department, which is considered the most technologically advanced abattoir in Europe, is described, although very little is mentioned regarding waste disposal. The site is remote from residential areas, but only a ten minute drive from the Picadilly center. The site was an unused clay quarry of 20 acres with an additional site of 7 acres near the main project for ancillary trades. The design is such that there is a functional progress in the conversion of live animals to dressed meat. The animals arrive by rail and road, and pass through lairage, slaughtering, chilling, and marketing. There are stalls and pens for 1,500 cattle and pens for 6,000 sheep and 800 pigs with special pens for bulls and calves. A physical barrier across the site separates the killing floor from the lairage to make certain that the hygienic conditions required for the dressing of the meat are not contaminated by the unclean lairage side. The barrier holds the drovers and animals within a prescribed area. Great care is taken to ensure maximum cleanliness and the retention of animals for long periods in lairage is discouraged by increased fees. Once slaughtered, the meat is chilled rapidly, and, from the slaughtering point on, the various processes work on an assembly line basis with all the inedible parts removed from the area as soon as they are taken from the carcass. Pictures are shown of the poultry hall, an aerial view, the lairage, and the market.

66-0451

Marais, G. R. New factors in the design, operation and performance of waste-stabilization ponds. Bulletin of the World Health Organization, 34: 737-763, 1966.

The BOD loading rate is governed by average daily radiation. If ice covers the pond in winter, spring surface loading must not exceed 20 lb BOD per acre daily to re-establish aerobic conditions quickly. High BOD loading rates are possible throughout the year in the tropics. A 90 percent reduction for total retention time of 3.5 days, leaving an effluent BOD of 20 to 40 mg per liter is attained at 35 C. The pond depth suggested is between 2 ft 6 in. and 3 ft. The minimum retention time in a primary pond and required surface area can be determined from equations given. Temperature influences intensity of anaerobic fermentation in the sludge. Fermentation reduces the sludge's organic load but releases products of fermentation to the supernatant liquid. In the Lusaka, Zambia, primary pond aloal concentration was 1.2 by 10 to the sixth per ml during winter and 1.0 by 10 to the fifth per ml in summer. Anaerobic pretreatment in lagoons has been used in America with industrial wastes. In Zambia household waste water is directed into the aqua privy tank; tank effluent is discharged by sewers into oxidation ponds for final treatment. For 59,000 people per acre, giving 3,700 lb BOD per acre daily, and 23 hr retention time, the ponds function satisfactorily. Oxidation ponds react favorably to pretreated effluents. The design of maturation ponds is based on retention time. The reduction of BOD, COD, ammonia, nitrogen dioxide, nitrogen trioxide, and nitrogen in maturation ponds is not great. Data, graphs, and equations are included.

66-0452

Messina, U. Pumping plants for foul waters and sewage sludge. Ingegneria Sanitaria, 14(4):170-189, 1966.

Diagrams, graphs, charts, and flow equations complete this technical description of the state-of-the-art of the hydraulic design and the operation of various types of pumps. Pumps are considered with respect to future needs for mechanical handling of sewage sludge. The size and type of pump used is determined by flow characteristics of the sludge, (turbidity, solid-particulate transporting, organic-material bearing, toxicity) and its location in industrial or residential areas. The mathematical description covers flow parameters, Bengham's plasticity factor, and coefficients of plastic viscosity. Some of the pumps mentioned are: centrifugal, screw, submersible booster pumps, sludge pumps, liquid vortex, and electric pumps on horizontal and vertical axes. Pipeline size, compressor plants, lift stations, pumping stations, valve regulation, cybernetics, and plant automatization are also discussed. (Text-Italian)

66-0453

Minch, V. A., and J. K. Sullins. Primary treatment of paper mill waste. In Proceedings; Fifth Annual Sanitary and Water Resources Engineering Conference, Nashville, Tenn., June 2-3, 1966. Technical Report No. 9. Vanderbilt University, Department of Civil Engineering. p.59-64.

A pulp and paper mill, producing wood pulp and a wide variety of white papers, has expanded to a pulp production rate of 240 tons and a paper production rate of 525 tons per day. A pilot plant study was conducted to obtain reliable design criteria for a full scale clarifier and trials were conducted to determine the optimum method of sludge disposal. The design of the primary treatment facilities was based on 14 million gal per day with satisfactory operations at 20 million gal per day. Total suspended solids removal was estimated at 74 percent. The plant was designed to operate with a minimum of supervision. The principal treatment unit is an EIMCO clarifier. Mill effluents are contained in two separate flows. One sewer contains effluents not requiring treatment which flow directly to the river. The effluent to be treated flows through a bar trash screen with continuous reject removal and enters the clarifier through a center feed well 20 ft in diameter. Sludge underflow from the clarifier is raked to a center sump which supplies a Bird Centrifuge. The sludge cake is trucked to a landfill disposal site. The single major problem was the inability of the sludge pumps to move the sludge solids of higher density experienced on a number of occasions. About 80 percent of the total suspended solids are being removed. Settable solids removal efficiencies are averaging 98 percent.

66-0454

Moiset, P. The separation of the components of fly ash. Aufbereitungs-Technik, (9):580-582, 1966.

The separation of the components of fly ashes, after removal of coal to be recycled to the firing section, is discussed. To determine the most feasible method for the separation, untreated fly ash was examined microcopically. Microphotos of untreated fly ash, a coal concentrate, and flotation tailings in polarized and unpolarized light are presented. These photos show that, after removal of all the coal, the tailings still contained a material resembling coal which is ferromagnetic. From a relatively poor ash (3.35% burnable components), an 8.93 percent coal concentrate with 34.33 percent burnable components, 88.67 percent tailings, and 2.40 percent magnetite was obtained. The process used in the separation is described and illustrated by means of a flow sheet. The ashes were concentrated, subjected to flotation, and the magnetite separated magnetically from the flotation tailings. The chemical composition of the magnetite fraction and the remaining material is given. (Text-German)

66-0455

Morris, J. C., and W. J. Weber. Adsorption of biochemically resistant materials from Solution 2. Publication No. 999-WP-33, AWTR-16. Cincinnati, 1966. 108 p.

Earlier studies (reported in PHS Publication No. 999-WP-11-AWTR-9) showed that activated carbon for waste water rénovation could best be used in continuous-flow columns. Such tecnhiques should result in an adsorptive capacity of greater than 10 percent. Results on studies of adsorption of organics from single- and multi-component systems in fluidized carbon are reported herein. The absorbability of organic pesticides on activated carbon was investigated in some detail. Studies were undertaken to characterize those types of organic pollutants that are not adsorbed on activated carbon.

66-0456

Myers, E. A. Engineering problems in year-round distribution of waste water. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.38-41.

Chlorinated effluent from the Penn State University treatment plant was pumped by two centrifugal pumps, operated alternately, over a solid set system of pipes. Each pipe was capable of discharging 350 gpm (500,000 gal per day) at a total head of 520 ft. A 6-in. buried pipeline transmitted the waste water 4 miles to a site which was 280 ft higher than the pumping plant. At the 2-mile point a half-mile long, 6-in. branch line carried effluent to another site, 175 ft higher than the pumping plant. All pipes beyond the branchline valves were above ground, and included 4 and 5 in. aluminum main lines, and 2 and 3 in. aluminum lateral lines. A solid set system was used throughout, all piping being stationary. The system applied waste water to field and forest crops. Various sprinkler spacings and heights above ground were used and several different effluent depths were applied. Systems most frequently used are tabulated. A monitoring program, involving the chemical and bacteriological analyses of water samples from wells and surface waters in the vicinity of distribution sites was instituted a year prior to pumping effluent and continued throughout the 3-year period. Pumping, pipe system, and irrigation head problems are discussed at length.

66-0457

N and P removal by bio-oxidation ponds. Public Works, 97(11):121-122, 1966.

An article, 'Removing Nitrogen and Phosphorus by Bio-Oxidation Ponds in Central Oklahoma,' by Joseph R. Assenzo and George W. Reid, in Water and Sewage Works, August 1966, is reviewed. Sewage lagoons or oxidation ponds widely accepted in America are considered the only device for effective removal of nitrogen and phosphorus. The present study was directed to investigate the lagoon as a device for preventing nutritional pollution. Logoons ranging in loading from 13 tp 150 lb of BOD per acre per day remove 30 to 95 percent of N and P. By the response surface technique, optimum loadings for nitrogen and phosphorus removal were determined as 19.5 and 11.23 lb of BOD per acre-foot per day respectively. Optimum loading to maximize phosphorus removal is considered more desirable than compromise loading. The loading maximizing P removal is about 50 percent lower than that maximizing N removal. The nutrient with the lowest concentration in the effluent controls subsequent algal growth and since N is fixed from the atmosphere it appears advantageous to minimize P concentrations.

66-0458

Nelson, W., and J. R. Eliason. Prediction of water movement through soils—a first step in waste transport analysis. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.744-758.

Recent theoretical advances in describing the flow of fluids in porous media are interrelated to problems involving the transport of pollutants through soils. A review is presented of the three broad phases of analysis necessary to predict waste transport through porous material: macroscopic fluid flow analysis; microscopic flow analysis for diffusion and hydrodynamic dispersion; and the reactions or interactions of contaminants with the porous material, organic material, or biological components of the soil. The relationship of contaminant type and the three analysis phases needed in both complete and approximate waste transport analysis are shown. The application of macro flow results to predict river contaminant concentration and the use of the basic water-time distribution are illustrated.

66-0459

Netzel, G. 15 years of progress in sludge dehydration. Staedtehygiene, 17(11):249-256, 1966.

Development in the dehydration of sludges is discussed. At the end of the 1920's rotating filters were studied. At that time it was easier to dehydrate the sludge by adding quicklime. A. Wright used a filter tissue with the scraper filter then in use, but the filter tissue streched and narrowed from the strain. Later, especially after World War II, many types of filters were developed in the U.S. and Germany. In Germany, the disk filter came into use but was soon abandoned in favor of a centrifuge. This did not prove to be a success and the rotating filter returned to vogue, equipped with a scraper to remove the filter cake. Soon after, the Heymann shaking screen was devised with a capacity of 10 to 20 cu m per sq m an hr, but only 40 to 60 percent of the solids in the sludge were retained. By connecting several sieves in tandem this was increased to 60 to 75 percent. In the 1950's the EDCO sludge concentrator, invented in the United States, was introduced, which brought a further improvement in the dehydration of sludges. Since experience showed that the colloidal parts in the sludge accounted for the clogging of the filter, metallic salts were added. This changed the ionic charge of the particles and they reacted to the addition of lime which resulted in flocculation. The effects achieved by adding either ferric sulfate or ferric chloride and lime and the effects of the unwanted side reactions are discussed. Another way of improving the filtering ability of sludges consists of adding sawdust, ash, etc. Ash did not prove to be the ideal additive because it is not inert and it is not available in a specific grain size. Some of the latest filtering methods are discussed, such as the cord-filter method. (Text-German)

66-0460

New sewage-treatment process uses coal. American City, 81(1):105, 148, 1966.

A test rig in Cleveland, Ohio, attained results equivalent to or better than a secondary sewage-treatment plant. Its two basic steps are filtration and adsorption, using the same crushed and sized coal in both steps. A mixture of coal plus the filtered sewage is continuously removed during the operation as a thick sludge. Filtration removes the solids from the sewage. Coal permits it to operate at a high and constant flow rate. Filtrate passes into a bed of coal in which organic contaminants are adsorbed. This process removes in large measures phosphates and hard detergents which are not removed by conventional secondary treatment. The effluent contains a very low concentration of nitrates. The coal-sludge mixture can be incinerated, or since it has a BTU value approximately 90 percent of the coal used, its value can be recovered and used as fuel. Total in-plant time is 2 to 4 hr as compared with 9 hr for activated sludge process. Most ranks of coal can be used. Coal use will average 5 tons per million gallons.

66-0461

New sludge burners. Chemical Week, 98(4):94, 1966.

At the Bayshore station, East Bay Municipal District, Oakland, California, incoming sludge passes down over six hearths by gravity while air for combustion passes from multiple inlets over the hearths in parallel to assure a constant excess of oxygen. Net products of the combustion are steam and a fine white ash which will not pollute Oakland Bay.

66-0462

Nicholson, R. W., J. Pedo, and J. Martinek. Wet air oxidation of sewage sludge. American City, 81(4):97-99, 170, 1966.

A batch-type Zimpro wet-air oxidation unit, designed to handle 5,700 gpd digested sludge containing 8.5 percent solids and 40 percent volatile matter, began operating in December, 1964, in South Milwaukee. The end product is a sterile, inert, solid residue and a supernatant liquor. Pumps first transfer sludge from clarifiers to a sludge storage tank. Steam generated in a water-tube-boiler is injected into the sludge. When reactor temperature reaches 370 to 400 F, compressed air enters until pressure reaches 500 psig. The incoming sewage condenses the steam and scrubs the gasses. After 16 to 19 hr of unsupervised aeration, the pressure is lowered to 180 psig. Oxidized sludge drains to a basin where predominantly inorganic ash settles in a few hours. One operator controls the day shift and devotes three hours to operation. Graphs and figures show performance data. Performance was 10 percent above the expected 60 percent COD reduction and 1170 lb removal of insoluble organic solids. Installed cost was $110,000. Each batch requires 800 kw-hr of power, 22,000 cu ft of natural gas for steam, and 9 lb rock salt for water softening. To reduce costs, they plan to have lower starting temperatures and reduced horsepower.

66-0463

Okun, D. A. Sludge disposal methods. Public Works, 97(5):168, 1966.

The Maple Lodge works near London tries to avoid water pollution by sludge disposal facilities. The installation of sludge drying beds equipped with mechanical lifting and removal systems, together with disposal of liquid digested sludge to farmlands provides an excellent opportunity for comparing the various methods of disposal. The plant consists of grit removal units, comminutors, sedimentation and stormwater tanks, and diffused-air activated sludge. Sludge treatment initially consisted of thickening tanks and sludge digesters. The digested sludge in the initial plant was to be pre-dried followed by incineration, the only plant of its type in Europe. Vacuum filters have never been completely successful except for the filtration of elutriated digested sludge from primary sedimentation tanks. Although the combined system of vacuum filters and heat treatment has succeeded in producing a dry granular product of commercial value, the entire output being sold through commercial outlets, the high production cost per ton of dry solids made it impossible to justify expanding the system with plant growth.

66-0464
Olson, O., and John Klingenberg. An aerated sewage lagoon. American City, 81(11):94-95, 1966.

An aerated sewage lagoon purification system in Harvey, North Dakota, is described. This system was favored over the use of a conventional lagoon because--(1) By operating at a ten-foot depth, it required only six acres instead of 40; (2) The small area required permitted the use of a site that could be served by a gravity line, thus eliminating the expense of a lift station; (3) The diffused aeration system insured successful performance even in sub-zero weather; and (4) Cost analysis showed that the cost of the aerated lagoon system would by $13.50 per capita instead of $23. Harvey's aerated lagoon system consists of two separate 1½-acre lagoons designed to operate in series. Each lagoon has a 20-day retention time. The waste flows to the primary lagoon by gravity. Overflow manholes allow each lagoon to operate at a ten-foot depth with continuou discharge to the Sheyenne River. Air enters the lagoons through a plastic header. Some 15,000 ft of weighted aeration tubing connected to the header lies on the floor of the lagoons in a predetermined pattern. Pinpoint bubbles, rising in lineal screens from the aeration tubing, continually roll the waste water over and over, before passing it on to the next cell. Analysis indicated an overall efficiency of 92.4 percent BOD reduction, even when both cells were ice-covered. Samples are now being collected monthly to determine the BOD, suspended solids, nitrogen, and bacteria reduction. To date, the data have been favorable.

66-0465
Parker, C. D. Food cannery waste treatment by lagoons and ditches at Shepparton, Victoria, Australia. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.284-302.

The wastes of two food factories, Shepparton Preserving Company and Campbells Soup (Aust.) Ltd., are treated by two distinct but closely integrated installations consisting of anaerobic and aerobic type lagoons and oxidation ditches. Performance and cost data are given for lagoon treatment facilities. It has been established that while complete purification of the waste can be effected at much higher BOD loadings to achieve continuous odor free operation it is necessary to restrict BOD loading on the anaerobic lagoons to 400 lb per acre per day during peak tomato processing and 200 lb per acre per day during peak citrus operation. The choice between aerobic lagoon and oxidation ditch is dependent on the length of the cannery season. Where the season is short as with fruit canning, the oxidation ditch is more economic. Where the flow continues throughout the year there are advantages in using aerobic logoons. These facilities incorporate for the first time, so far as known, the use of an oxidation ditch in the treatment of cannery wastes.

66-0466
Patrie, B. A., K. Keshavan, and F. E. Woodward. The effect of nitrification of organic wastes on waters in the natural environment--I. Effects of seed. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.869-879.

Methods were investigated by which concurrent exertion of the carbonaceous and nitrogenous oxygen demands might be induced in standard BOD bottles. These methods involved the manipulation of parameters known to favor or depress nitrification, namely, the type of bacterial seed, temperature and pH. The effect of three types of bacterial seeds in a 5-day, 20 C BOD determination at a constant pH 7.5 was dealt with. The bacterial seeds that contained an active flora of nitrifying bacteria exhibited greater BOD exertions than a bacterial seed lacking these organisms. Results also showed that the nitrate production was occurring quite vigorously even from the start of the incubation period with each of the nitrifying seeds. The ultimate BOD values for the tests with the nitrifying seeds were generally higher than those with a non-nitrifying seed, indicating the oxygen uptake due to nitrification. Unless a proper bacterial seed is selected for laboratory BOD tests, there could be a serious discrepancy between the predicted and the actual dissolved oxygen levels in a natural body of water.

66-0467

Pickering, W. Some aspects of sludge disposal. Royal Society of Health Journal, 86(2):85-89, 1966.

Because of the failure of the sludge drying beds at Tunbridge Wells to provide the necessary dewatering of sludge prior to disposal, a series of experiments were conducted to determine the adequacy of a 4/1 sludge concentrator as a cheap method of dewatering. The tests were conducted on a Davey Paxman Sludge Concentrator with 4 roto-plug cells which acted as sludge thickeners and a compression filter as a second stage. The previously settled sludge is fed into the roto-plug section which has rotating cylinders fitted with a continuous nylon filtering material through which some of the water passes reducing the water content from 96 to 85 percent. With the rotation of the cells, the sludge collects and forms a rolling cylindrical mass known as the roto-plug which acts as a collecting agent. When the plug reaches 8 in. in diameter it is cut off and further dewatered to 70 percent by a compression filter. A table is given of data showing the effects of the addition of paper pulp on the dewatering. A second table shows the effect of the method on the fines which had previously passed the nylon mesh. The crude sludge was successfully dewatered without the addition of paper pulp although a relatively small amount of paper pulp was required to prevent a build-up of fines. The cleaning of the nylon filtering was important to the effective dewatering of the sludge. The tests indicate the suitability of the method to successfully dewater sludge without a build-up of fines.

66-0468

Purdue University. School of Civil Engineering. Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. 1071 p.

The twenty-first Industrial Waste Conference was sponsored by Purdue University in conjunction with the Indiana State Board of Health. Certain agencies of the State of Indiana also supported the Conference. Twenty-one papers relating to solid waste were included in the presentations. The papers covered such topics as treatment of industrial and animal wastes, regional pollution control, polluted waters, and effects of temperature on the characteristics of waste. The are many charts, graphs, and photographs throughout and many of the papers have extensive bibliographies. At the end of the second volume of this two part work (pp.1021-1069), there is a comprehensive author and subject index to the last ten Proceedings that have been published.

66-0469

Quirk, T. P., R. C. Olson, and G. Richardson. Bio-oxidation of concentrated board machine effluents. Journal of the Water Pollution Control Federation, 38(1):69-84, 1966.

Results of a laboratory-scale study are reported on the feasibility of bio-oxidation of machine wastes from the production of mineral and wool fiber insulating boards. A batch system using activated sludge was used with concentrated machine effluent from the production of wood fiber board as the waste source. The article is illustrated by three pictures of laboratory equipment, three tables, and ten graphs on oxygen balance, oxygen requirements for assimilation, oxygen uptake rates, BOD adsorption of sludge stabilization, BOD loading and removal, oxygen transfer characteristics, and clarification characteristics. The metabolism of BOD in the presence of nutrient required 0.34 lb of oxygen per lb BOD removed, with a sludge oxidation rate of 9 mg oxygen per hr per g of sludge. Without nutrient feed or pH control, the unit oxygen requirement dropped to 0.28 and the sludge oxidation rate to 2.5 mg per hr per g. The activated sludge showed significant BOD adsorptive capacity; up to 75 percent of the applied BOD was removed by initial adsorption. A minimum aeration time was required to metabolize adsorbed BOD and stabilize the activated sludge. The stabilization time increased in proportion to the sludge loading and was reduced significantly by the addition of nutrients. In the presence of nutrients a maximum process loading of 1.2 lb BOD per lb sludge per day could be used without reaeration. Oxygen transfer characteristics of raw and oxidized waste were poor. The sedimentation and compaction characteristics of the activated sludge required high return-sludge rates in order to use clarifier overflow rates above 600 gpd per sq ft (24.5 cu m per day per sq m).

66-0470
Radcliffe, H. Dual-purpose centrifuging at Treasure Island, Fla. Water and Wastes Engineering, 3(9):87-90, 1966.

Treasure Island, Florida, had 703 permanent residents in 1950 and 3,506 in 1960. By 1962, the activated sludge plant, built in 1951 and expanded in 1957, was working at capacity. The plant was located on a small tract surrounded by a power substation, a large restaurant and group of stores, valuable commercial land, and Boca Ciega Bay. (The island is less than a quarter of a mile wide at this point.) The basic problem was to double treatment capacity without increasing plant space requirements. Four methods of expansion were considered: three involved doubling the height of the existing plant, construction of another plant at a remote site, or buying the eexpensive commercial property adjacent to the present site. The fourth plan, which combined a dual-purpose centrifuge (for concentrating waste activated sludge and dewatering digested sludge) with process conversion to contact aeration, provided the space saving expansion. The use of a solid bowl centrifuge permitted outdoor installation in a small corner of the plant area. This machine has proven versatile for dual-purpose use. The result has been an increase in digester capacity without the installation of additional digester components. Technical details are included and the costs described.

66-0471
Rands, M. B. Development and operation of a low cost anaerobic plant for meat wastes. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.613-638.

The study of meat waste treatment was commenced by Auckland Export Meat Packing Companies about 1950 in cooperation with the Auckland Metropolitan Drainage Board. The general layout of the plant is shown, the nature of the raw wastes and their chemical analysis are tabulated, the treatment is described. First, solids are removed from the raw wastes by mechanical means. Next, the anaerobic digestion commences in balancing tanks which act as unseeded, uncontrolled digesters and achieve a small measure of BOD reduction. The choice of an oxidation pond for tertiary treatment is dependent on sufficient land being available and a suitable climate for adequate algae growth. Plant costs for operation and maintenance over a ten-year period are listed. A table summarizes the performance of the plant expressed as percentage removals of BOD, suspended solids, settleable solids, total grease and albuminoid nitrogen and shows that strong meat wastes having BOD of the order of 2,000 mg per liter can be converted to a chemically stable final effluent with BOD of the order of 30 mg per liter.

66-0472
Reece, G. M. Plant expanded to meet industrial waste load. Public Works, 97(12):63-67, 1966.

Additions provided for the sewerage system of Cranston, Rhode Island, to enable it to accept industrial waste loads and the increased loads expected by 1985, are described. The plant was designed for a 20-year period. The population, flow rates, BOD and suspended solids loadings used for design purposes are tabulated. The design capacity of the waste water treatment facilities is for an average daily flow of 11.4 MG and a BOD loading of about 40,000 lb per day. The new facilities also included units for primary treatment to remove grit, grease, and settleable solids; units for secondary treatment by a modified, activated sludge process which is capable of being adapted to the step aeration process, the Biosorption process, or the Kraus process; an additional sludge digestion tank and digester heater building; blower building to house the new air blowers, chlorination building, and new chlorine contact tank for disinfection of the treatment wastewaters. The treatment processes, aeration system, settling tanks and sludge pumps are described in detail, and the dimensions of treatment units are tabulated. Construction costs of the project, which included expansion of the treatment facilities, modification of the main pumping station and the construction of a force main sewer, was about $2,570,000.

66-0473
Riddell, M. D., and J. W. Cormack. Ultimate disposal. Presented at the 39th Annual Meeting, Central States Water Pollution Control Association, Eau Claire, Wisconsin, June 9, 1966.

The problem of ultimate sludge disposal comprises: treatment to produce an acceptable end product, transportation to the point of disposal, and disposal in such a manner as to require no further attention. It is necessary to digest, heat dry, or oxidize sludge first. After such treatment, the sludge may be spread on land, deposited in landfills or in natural or artificial cavities, used as fertilizer, deposited in the ocean, or converted to useful materials. Comparison of cost of transporting wet sludge by tank truck, tank car, and pipeline indicates that tank trucks are the most economical for small communities. Railroad tank cars do not become economical until the distance is about 150 miles. Pipelines are not economical for transporting small amounts of sludge, but the unit cost drops rapidly as the quantity increases. The quantity at which pipelines become more economical than truck or rail transportation is related to the distance the sludge is transported, being greater for longer distances. The spreading of wet sludge on land, where applicable, seems to be the most economical method of sludge disposal. Incineration, wet oxidation, and the production of fertilizer are relatively expensive treatment methods but they greatly reduce, or eliminate, the costs of transportation and ultimate disposal, and require relatively little land.

66-0474
Riley, B. T., J. E. Kiker, and C. I. Harding. Autoxidation of wood distillation wastes with oxygen. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.926-942.

Treatment of wastes from the Cabot Carbon Corporation, Gainesville, Florida, which processes mainly coniferous woods, is reported. Research on wool distillation waste was concerned with the use of autoxidation as a treatment prior to biological treatment by conventional methods. Twenty liters of a selected dilution of waste were added to a reactor and liquid samples were taken at regular intervals during an autoxidation reaction while the temperature and partial pressure of oxygen were held relatively constant. Temperature was found to be the most important factor in stablizing the rate and the completeness of an autoxidation reaction. The partial pressure of oxygen affects the rate directly by affecting the availability of oxygen to the chain reaction type of mechanism. Autoxidation with oxygen offers the promise of being an excellent method for treating wood distillation waste.

66-0475
Roberto, S., and E. P. Madsen. Pulps from sawmill waste and thinnings. Tappi, 49(9):54A-55A, 1966.

In an effort to exploit the extensive growth of Pinus radiata in Chile, it was considered important to utilize any waste both in the forest and during conversion. The problem of the waste from sawmilling, such as wings, off-cuts, dockings, and rejects, was of special interest because of the disposal difficulties. The object of this investigation was to determine the feasibility of converting the waste material into chips for use as a raw material for pulp and paper mills and to compare the pulps obtained from forest thinnings and from sawmill waste of Pinus radiata. The physiomechanical properties of pulps prepared from sawmill waste and thinnings by the sodium bisulfite and sulfate processes were studied. Pulping was carried out in a rotating laboratory digester on the chips and thinnings under conditions simulating those used in local industries. Tables are given showing the cooking conditions, the physical analysis, and the chemical analysis of the various pulps prepared. Charts are given which plot the breaking strength, the folding endurance, burst factors, tearing area, and Canadian Standard Freeness. Some variations could be predicted from the morphological and chemical differences between juvenile and mature wood. The basic advantage from the pulping of chips from sawmill waste is the greater physicomechanical strength of the pulp, independent of the method used.

66-0476

Rollag, D. A., and J. N. Dornbush. Anaerobic stabilization pond treatment of meat packing wastes. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.768-782.

The advent of the stabilization pond into the meat processing waste treatment field has been due, in part, to the desire for low-cost waste treatment. New, small abattoirs and packinghouses are locating in rural communities where sufficient land is available for this type of treatment. This investigation was conducted on an anaerobic stabilization pond system treating the wastewater from the Minnesota-Iowa-Dakota (MID) Packing Company, Luverne, Minnesota. The design and performance of the system was evaluated during the winter operation. The wastewater from this establishment, which represents a medium sized slaughterhouse, can be expected to produce the following unit pollution contribution in terms of the number of animals processed: waste flow (800 gal per 1,000 lb live wt); five-day BOD (7.1 lb per 1,000 lb live wt); suspended solids (3.5 lb per 1,000 lb live wt).

66-0477

Sawdust makes bid to up its stature with pulpmen. Chemical Engineering, 72(22):96-97, 1966.

Sawdust, formerly regarded as a nuisance, a difficult fuel, and a pollutant when burned by sawmills, is now being considered as a cheap raw material for kraft pulp which could increase pulp output by 15 percent or the equivalent of 7.3 million cords. In Longview, Washington, one 150 ton per day unit has been operating satisfactorily on sawdust for more than a year. Sawdust enters the M and D Continuous Digester, normally used for semichemical pulp, through a rotary valve which avoids compression, fiberizing, or damaging the feed, and is moved through a 25 percent sulfidity white liquor in 20 to 40 minutes at 150 psi and 365 F, with enough liquor added to cook the sawdust. This digester gives a pulp yield of over 45 percent producing board and bleachable grades of pulp suitable for use as an up-to-20 percent constituent in paper or board without noticeable loss in strength.

66-0478

Sproul, O. J., K. Keshavan, and R. E. Hunter. Extreme removals of suspended solids and BOD in tannery wastes by coagulation with chrome tan dump liquors. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.600-612.

Design criteria for a treatment plant for a chrome tanned cattleskin tannery waste were developed. During the course of this work, the tannery changed its processing so as to recover hair. It was desired to develop a system which would maximize the removals of suspended solids in addition to the BOD. The methods involved in the individual design criteria determinations are presented. The coagulation studies were carried out using an anionic polyelectrolyte which possessed a cost advantage over the metallic coagulants. Sedimentation curves, a summary of the BOD and suspended solids removals obtained for each sample are presented. Equalization of plant flows and utilization of the coagulating action of chrome dump wastes gave suspended solid and BOD removals of up to 99 and 50 percent, respectively, after settling of the waste. Change over of the dehairing process from a high lime sulfide to one using a proprietary unhairing compound and less lime and sulfide reduced the total plant BOD and suspended solids by 25 to 45 percent.

66-0479

Thackston, E. L., and P. A. Krenkel., ed. Proceedings; Fifth Annual Sanitary and Water Resources Engineering Conference, Nashville, Tenn., June 2-3, 1966. Technical Report No. 9. Vanderbilt University, Department of Civil Engineering. 242 p.

The stated purpose of this conference is to satisfy the need for exchange of information and discussion of policy concerning the sanitary and water resources engineering problems confronting industry, consulting engineers, municipalities, and regulatory agencies in the Southeastern United States. The 19 papers herein presented covered the following topics: low-flow analysis of streamflow data;

deep-well disposal of chemical waste water; use of the digital computer to analyze hydrologic problems; primary treatment of paper mill waste; anaerobic pre-treatment of packing house wastes; treatment of acid waste waters; operation and problems of a chemical waste incinerator; the TVA composting project; the systems approach to sanitary and water resources engineering; design of diatomite filter plants; mixed-media filtration; the Federal water quality and solid wastes programs and Clean Air Act; industrial control applications; survey for estimating domestic contribution to air pollution; source reduction in the pulping industry; a foam-phase air cleaning device, and improvement of gas flows by model investigations.

66-0480
Trade refuse. Public Cleansing, 56(12):615-618, 1966.

A report summarizing remarks and informal papers on trade refuse is presented. It would be feasible to collect and dispose of shop refuse on a rechargeable basis or otherwise but apparently the problem would become different if large quantities would have to be removed daily. There are sound reasons for aiding a local producer to dispose of waste; he pays taxes and provides jobs. Manufacturers might be encouraged to find useful outlets for their waste. New industries should plan with the local authority regarding waste disposal. West Bromwich provides an industrial waste service more cheaply than a private company. The problem of putrescible organic wastes from poultry stations, which require special handling and disposal techniques was also discussed. A frequent problem is the free removal of wastes requested by industrialists or shopkeepers. This is beyond the limits of local authority responsibility. Lack of a precise legal definition of trade refuse adds to the difficulty. Various specific inequities and local problems are mentioned. The Aberdeen Corporation's system for the collection of trade refuse, together with the charges made, is described. The moral and esthetic necessities of trade refuse removal and disposal are discussed, and the reclamation of land and the disposal of wastes in Grangemouth are described.

HAZARDOUS WASTES (including Pesticides)

66-0481
Breidenbach, A. W., J. J. Lichtenberg, C. F. Henke, et al. The identification and measurement of chlorinated hydrocarbon pesticides in surface waters. Washington, Federal Water Pollution Control Administration, 1966. 70 p.

An introduction, sample collection, preparation of sample preliminary to gas chromatographic analysis, determinative steps, control of interferences, sensitivity and specificity, and five appendices are presented, in addition to data and numerous illustrations and a list of references. The Federal Water Pollution Control Administration Surveillance System was established under the Public Health Service to collect and disseminate basic data on chemical, physical, and biological water quality insofar as such data relate to water pollution, prevention, and control. There are now 131 sampling stations. The analytical work of the system is devoted to characterization of surface water samples in six broad areas. These are biological, microbiological and particulate matter, radiological, general chemical as well as physical properties, and synthetic organic chemicals. Various methods of collecting samples and procedures to the various methods of analyses and preparations of samples are outlined and presented. The carbon adsorption method has been effectively employed in pesticide pollution studies. While it is essentially a qualitative screening and continuous sampling technique when used on untreated surface waters, the method provides minimum quantitive values for measurement of specific substances. The method has proved to be very useful for obtaining samples large enough for corroborative infrared and chromatographic identifications at low concentration levels.

66-0482
Carlson, D. A., and R. C. Gumerman. Hydrogen sulfide and methyl mercaptan removals with soil columns. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.172-191.

It was decided to use the soil filtration principle for the removal of hydrogen sulfide and methyl mercaptan from industrial sources. Phases of the research included studies of physical and biological changes in the soil, degradation rates of hydrogen sulfide and methyl mercaptan, and ideal soil depths. Laboratory studies on removal of gases by passage through soil columns were conducted in Fiberglass tubes with 5 distinct soils. The use of soil bacteria as a method for removing odor from gaseous mixtures appears feasible. Results showed efficiencies approaching 100 percent removal after a 6 to 8 week acclimation period, using only 3½ ft of soil. No optimum soil depth could be established, since the bacterial population was still increasing at the end of the test period.

66-0483

Final disposal methods. Reactor Fuel Processing, 9(4):233-234, 1966.

As part of the Hanford waste-management program, existing underground tanks will be utilized for permanent storage of intermediate-level-activity plant wastes that have been concentrated to a solid cake by in-tank evaporation. Wastes were evaporated within the in-tank by sparging with heated air. The air sparger also served as an air-lift circulator. The moisture-laden air was heated. It was drawn from the tank through a deentrainer, a filter, a condenser, and finally exhausted to the atmosphere. During ten months' operation, some 1,500,000 gal of highly alkaline wastes were evaporated. Waste volumes were reduced by a factor of more than three. More wastes, however, must be evaporated before the solidification aspect can be demonstrated on a full scale. Decontamination factors were routinely obtained. The deentrainment process needs improvement. The suitability of salt mines for storage of high-level-activity solids is now being demonstrated. The confirmation of feasibility and a safety of disposal, the demonstration of required equipment and techniques, the determination of the salt stability under the influence of heat and radiation, and the collection of information on creep and plastic flow of salt will be investigated. Fourteen irradiated fuel assemblies provide the radiation source. After 50 days of operation, no radiation effect on salt flow or stability was noted. Thermal floor expansion and increased transverse expansion rates in the pillars adjacent to the array room have met expectations. Increased roof movement has indicated that an extra margin of stability must be established.

66-0484

Lead poisoning from scrap metals. Waste Trade World, 109(13):13, 1966.

Ten of the 17 cases of lead poisoning reported in the annual report of the Chief Inspector of factories on industrial health were caused by acetylene torch cutting of scrap metal painted with lead paint. There is a close similarity between many aspects of this work and shipbreaking, although the cutting-up does not normally involve work in confined spaces or where ventilation is defective. Two case histories are reported where lead poisoning coincided with jaundice and in one case also with a duodenal ulcer.

66-0485

Marks, D. R. Operation and problems of a chemical waste incinerator. In Proceedings; Fifth Annual Sanitary and Water Resources Engineering Conference, Nashville, Tenn., June 2-3, 1966. Technical Report No. 9. Vanderbilt University, Department of Civil Engineering. p.99-105.

The wastes of a Memphis, Tennessee chemical company, intended for incineration, include organic acids, their salts and anhydrides, various chlorinated hydrocarbons and chlorocarbons, hydrocarbons, particulate carbon, and inorganic salts. Because of the lack of data on the heating value of the wastes from the various plant sources, it was decided to run actual tests. It was decided to proceed with installation of a commercial burner based on design data obtained during the tests. The burner consists of a natural gas-fired vortex burner inserted into the side of one end of a firebrick-lined combustion chamber. The horizontal combustion chamber is attached to the inlet of a hydrogen chloride scrubbing tower 9 ft in inside diameter and 23 ft high. This scrubbing tower is brick lined for acid resistance and is packed with 2 in. Berl saddels supported on Herculite glass grillage. The problems that became apparent as soon as the burner was first put in operation are described. In spite of the problems, incineration is still considered a most practical method for disposal of many wastes.

66-0486

McCarty, P. L., and P. H. King. The movement of pesticides in soils. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.156-171.

In order to evaluate possible effects on surface and groundwater resources, it was necessary to determine the principal factors which govern the movement of pesticides in agricultural soils. The experimental work relates to the movement of six organic phosphorus insecticides in four agricultural soils. It was concluded that the extent of adsorption of the selected pesticides on agricultural soils may be correlated with the clay content of the soils. The rate of movement of pesticides in soils is inversely related to the extent of adsorption. In predicting the leachability of the pesticides in soils, the processes of adsorption and degradation are considered together. Thimet, disyston, methyl parathion, and parathion moved relatively rapidly in soil-water systems; ethion and trithion moved more slowly. Methyl parathion breakdown was very rapid; thimet, disyston, and trithion had intermediate stabilities, while ethion was relatively persistent. Parathion was fairly persistent initially but was degraded readily after biological acclimation took place.

66-0487

Reclamation of radioactive wastes. Waste Trade World, 109(5):6, 1966.

Techniques in nuclear fuel processing and waste management were shown in the American exhibition of nuclear products at Basel, Switzerland. Nuclear Fuel Services showed how important the reprocessing of spent fuel elements for the recovery of uranium, plutonium and other valuable isotopes is to the economic and technical success of nuclear power generation. The company chemically processes as much as 300 tons per year of spent nuclear fuel and operates the largest commercial center for the disposal of radioactive wastes. At Isochem's Fission Products Conversion and Encapsulation Plant a new process for storing radioactive waste was developed. By removing a few long-lived radioisotopes from the underground tanks in which radioactive solutions were stored, it was found possible to cut the period of self-boiling from decades to a few years. The material which was left over was easier to contain and could be compressed to solid salt cakes much more quickly. The radioisotopes removed can be used as safe, useful sources of radiation, heat and power.

SALVAGING

66-0488

Airstream technique of rag sorting. Waste Trade World, 109(3):12, 1966.

Polymark Ltd. has introduced the Airstream Classomat, a mechanized method of sorting, weighting, and progressing soiled linen to various types of washrooms. Many applications in the sorting of textile wastes could undoubtedly be found for the equipment. The primary unit uses electrical fans to generate an airstream and an input belt to inject articles into the airstream through metal trunking with as many as 14 outlet ports. By means of a selection key, the sorting operator can cause a diversion in the airstream, thus classifying articles into batches. The primary unit can be used to blow the work vertically between floors. High operator production can be achieved and considerable floor space saved, compared with standard hand-sorting techniques. The Classomat can be fully mechanized by means of Polywayer, which classifies articles according to weight.

66-0489

All purpose mobile crane. Waste Trade World, 108(10):15, 1966.

The Hornet, a new lightweight, multi-purpose mobile crane in the Hydrocon range, was introduced by Lambert Engineering Ltd., in Glasgow. The cost is approximately £1,500. The 2½ ton crane has hydraulic transmission with two-pedal control, and is equipped with a simple forward/reverse lever permitting extremely fast handling. The controls are integral with the front steering wheel assembly, and the whole unit can be slewed through 360 degrees in either direction. The manufacturer claims that its maneuverability, compact dimensions, and tight turning circle make the machine ideal for general industrial application. It can pass fully loaded through an 8 ft 6 in. doorway, and it has been designed to pass beneath the chassis of a truck to ensure precise positioning of loads. The telescopic jib can lift one-ton loads up to 16 ft 6 in.; fast hydraulic extension is provided up to 8 ft, with manual extension to 17 ft out-reach. Maximum speed is 18 mph. The crane can be adapted for specialist handling and offers many optional fittings at the jib head.

66-0490

Aluminum foil scrap recovered with induction melting system. Industrial Heating, 33(4):636, 1966.

Republic Foil, Inc., Danbury, Conn., recovers aluminum foil at its Salisbury, N.C. plant by use of an induction melting system. The new facility is expected to enable Republic to recover over 5 million lb per yr of aluminum from scrap foil. The complete melting system includes a coreless steel-shell, hydraulically tilted induction furnace with a 1,400-lb aluminum capacity, plus a 250-KW 180-cycle power and control unit. It is capable of melting scrap foil at a rate of 850 lb per hr.

66-0491

American Public Works Association. Salvage and reclamation. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.316-331.

Salvage and reclamation as a disposal method greatly depends on the market for salvage and refuse by-products, which often fluctuates a great deal. Decision in favor of this method should be made strictly on the basis of engineering and cost studies as the declining salvage market may easily cause discontinuance of the operations. Tabulated results are presented of the analysis of household rubbish in the District of Columbia by selected months and days, reporting also prices for various materials salvaged, and their fluctuation. The 'all-out' salvage of either rubbish or combined refuse has been mostly abandoned now in favor partial salvage. Partial salvage is carried out at the source, at the incineration plants, or at landfill sites. Incinerator residue enables salvage of ferrous metal, and also fly-ash. Various other uses for incinerator fly ash are stated and special consideration is given to the use of waste heat. It is estimated that 1 lb of refuse burnt in New York incinerators will produce from 1 to 2 lb of steam. The dehydration of garbage and the disposal of automobiles for scrap metal are also discussed.

66-0492

Ancillaries for cranes. Waste Trade World, 109(26):13-15, 1966.

The various types of magnets, grabs, and tongs which are available for lifting different types of scrap are surveyed. If the scrap is regular in shape or baled, simple ancillaries which can be used with a single drum crane are adequate. With irregularly-shaped scrap, the type of ancillary equipment required can be used only on cranes with two or more cables. For irregularly-shaped loads, rectangular magnets are best for thin material which is likely to project a distance on either side as bars and rods. The circular magnet is best for scrap of varying sizes and shapes. The use of aluminum for copper in the magnet coils has helped to combine a high ratio of magnetic power in relation to total weight. Among the giant magnets is the 100-in. diameter Pow-r-light of the Proler Steel Corp. of Houston, which has a bite half again as large in area as the largest conventional magnets. Like many of the others, it has an anodized aluminum strap-wound magnet. One of the current developments of interest is the combination of a cactus grab with a magnet. This combination saves time required for changing ancillaries and also prevents a large proportion of short steel dropping through the sides. The multi-jaw variety is normally the only practical grab and there may be six, eight or more arms which claw at the scrap. It requires two or more drums, if the grab has two or more jaws, working individually or in pairs under an independent hydraulic system. With such an arrangement, it is possible to pick up single units which are irregularly-shaped such as car bodies, cookers, and washing machines. The various types of magnets, grabs, and tongs available and their manufacturers are listed.

66-0493
Anthony, W. B. Utilization of animal waste as feed for ruminants. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.109-112.

Present trends are for both dairy and beef cattle to be managed in confinement. There is much interest in developing new and improved methods of handling manure, and there is evidence of large nutritional value in manure. A series of controlled experiments with different environments, feed combinations, and methods of preparation, showed that feedlot manure was a valuable source of vitamins and amino acids. Washed manure was mixed with a concentrate feed and successfully fed to steers. The mixture became a palatable and nutritious low-moisture silage when blended with coastal bermuda grass hay.

66-0494
Assessing the impact. Waste Trade World, 108(21):6-7, 1966.

A new process for upgrading low-grade scrap, Prolerization, developed by Proler Cohen, is described. The high impurity content of light scrap, such as stoves, refrigerators, and office equipment, has made disposal difficult and profits low. Merchants who sell all available light scrap to Proler plants will be able to get bigger profits from a smaller capital outlay. The plants convert low-grade scrap into a valuable raw material suitable for the high-quality sheet steel for the car and consumer goods industries. Transportation of 'bangers' to Proler plants is another profit-making aspect; emphasis is on the development of new ideas to meet transporting needs. A vast new and profitable outlet for low-grade scrap will thus be created, involving a radical structural alteration in the scrap industry, in which small and medium-sized firms can share.

66-0495
Bhat, T. R. and S. Sundararajan. Recovery of vanadium from Bayer liquor. Indian Journal of Technology, 4(5):162, 1966.

The recovery of vanadium from Bayer liquor as a byproduct in the extraction of gallium by electrolysis, using nickel anode and mercury cathode, is reported. The vanadium content was determined by the lead vanadate method. Tabulated data include the weights of the precipitate and the corresponding vanadium contents obtained at different time intervals at 30, 40, and 55 C. The weight of the precipitate decreases initially with time and then tends to increase, especially at higher temperatures. The vanadium content decreases in time in all cases. The vanadium content as well as total vanadium recovery are higher at elevated temperature with maximum recovery at 55 C. Under optimum conditions (cathode c.d., 1 amp per sq dm; anode c.d., 9 amp per sq dm) about 95 percent of vanadium has been recovered as a concentrate of purity greater than 80 percent. Since vanadium is obtained as a byproduct in the extraction of gallium without additional power consumption or change of experimental conditions, its recovery reduces the production cost of gallium.

66-0496
Brockie, W. Contraries in wastepaper. Public Cleansing, 56(11):571-572, 1966.

A contrary in wastepaper is any material which cannot be converted into paperboard and therefore has no board-making value. Contraries can also cause severe wear and tear on machinery and, if not eliminated, may cause blemishes in the finished board and make it unsaleable. Contraries are non-pernicious (materials obviously not wastepaper and hence easily recognized: string, glass, metal, cinders, tins, shoes) and pernicious (materials not easily detected as not wastepaper, such as latex, non-water soluble adhesives, waxed liminates, wet strength resins, brittle, plastic articles made from polystyrene, polypropylene, etc.). These brittle plastic articles are appearing in increasing quantities and are a problem because they are similar in appearance to paper, they disintegrate into small particles which pass through the normal wastepaper stock screening processes and produce blemishes in the finished board. These plastic articles come from vending machines, ball-point pens, toys, etc. One ounce of brittle plastic in a hundred pounds of wastepaper makes the paper unacceptable to board mills. Every effort should be made to keep these pernicious contraries out of wastepaper which is about to be baled.

66-0497

Bury marches ahead. Public Cleansing, 56(7):332-334, 1966.

A reconstructed refuse disposal plant in Bury, England, is described. A new reception hopper was erected and a dust extraction house was added. The existing buildings were modified to accommodate new screening and separation machinery. A plant for the handling of waste paper and the baling of tins was included in the new construction, as well as alterations to the remainder of the existing buildings to give additional working areas and storage spaces and finally the erection of a new canteen block, away from the main plant, incorporating showers and toilets. The surrounding area was surfaced and landscaped. The reception hopper with a capacity of 100 cu yd is of the upswept discharge type to prevent blocking. The refuse is discharged from there onto a 3-ft elevating conveyor to the horizontal screen through which it is propelled by an internal spiral and onto the picking belt, where paper, textiles, and nonferrous metals removed by hand are placed into chutes for discharge to the respective baling presses. An overband magnetic separator at the end of the belt discharges tins and ferrous metals into a chute for direct loading into a baling press with ram power of 34 tons. The tailing are then fed into a four-cell trough grate Heenan incinerator. Two separate dust extraction plants (canvas bag type filters) were installed, one at the reception hopper and one for various transfer points throughout the system.

66-0498

Calcium carbide allows more scrap in BOP. Chemical and Engineering News, 44(25):21, 1966.

A steel production technique that allows inclusion of 50 percent scrap in the charge to a basic oxygen process (BOP) furnace is described. The technique involves addition of calcium carbide to the charge to provide the heat for melting the extra scrap. Pittsburgh Steel began using the calcium carbide modification last year and is now using it on a production basis. The scrap charge in production heats was boosted to 40 percent last January and to 51 percent by April. The advantages gained by the calcium carbide modification technique are: (1) available hot metal can be stretched into more steel ingot tons; (2) BOP users gain flexibility; when scrap prices are lower, more economical mixing of scrap-to-hot-metal in the charge can be used, or more in-house scrap can be utilized. A charge of 20,000 lb of calcium carbide generates 87 million Btu and permits 102 tons of scrap in a 200-ton heat. The calcium carbide technique requires more oxygen than BOP normally does, and this is accompanied by an increase in blowing time. A typical increase is from 20.6 minutes to 23.1 minutes. Other processes are under investigation to increase the amount of scrap that can be incorporated into the charge for BOP furnaces. Air Products and Chemicals is working on an oxy-fuel burner that would be used to preheat the scrap, thereby increasing the scrap-melting capacity of BOP furnaces.

66-0499

Capp, J. P. Fly ash utilization. Combustion, 37(8):36-40, 1966.

The production of 20 million tons of fly ash by coal consumers in the United States in 1965 with an estimated 30 million tons by 1970, of which only 739,000 tons are utilized, results in an economic problem, with the disposal costs varying from $0.20 to $1.75 a ton, as well as an aesthetic problem. Because of the possible effect on the cost of operation of coal-burning power plants of fly ash disposal, additional markets are needed. The present situation in fly ash utilization is reviewed and the recent advances and current programs in utilization technology are surveyed. The present and/or potential utilization of fly ash is discussed for lightweight aggregate: stabilized bases for highways, concrete and concrete products, asphalt paving, abrasives, soil conditioner, building bricks, water treatment, and pesticides. The importance of research and increased marketing efforts for established uses as well as for new applications is indicated. Pictures are given of the effects of mixtures of soil and sintered fly ash on soybeans, rye, and cowpeas. Pictures are also given of the equipment used in preparing pelletized lightweight aggregate and the fly ash in various stages of the process. Pictures of the sintered fly ash show the magnetic and non-magnetic fractions. Even in the case of the 235,000 tons of fly ash used in lightweight aggregate the usage is negligible compared to the 15 million tons of conventional lightweight used each year. Sintering of fly ash should increase its acceptance as a soil conditioner. Cooperative research efforts are urged as well as an effective trade association.

66-0500

Capp, J. P., and H. Faber. Technology and economics of fly ash utilization. Washington, U.S. Department of the Interior, Bureau of Mines, 1966. 7 p.

Fly ash utilization has increased in recent years, but is still only a small percentage of the yearly output. A recent survey of 57 companies revealed that almost half of them did not sell any fly ash and more than half of the fly ash sold was marketed by only 9 companies. This indicates a need for greater selling effort and better marketing. While raw-material costs of fly ash are favorable, transportation costs, competition with natural products, and development of more applications are major deterrents to wider use. Development of more applications depends on the expansion of research efforts by fly ash producers, processers, and State and Federal agencies. The Bureau of Mines built a pilot plant and converted fly ash into a lightweight aggregate suitable for concrete blocks and other masonry products that met American Society for Testing and Materials (ASTM) standards. In cooperation with the Department of Agronomy and Genetics, West Virginia University, the Bureau is also investigating the use of fly ash as a soil conditioner and source of trace nutrients, such as boron, for plants. Sintered fly ash is being studied for this application because sintering eliminates certain objectionable characteristics of raw fly ash. Tests are also being conducted in cooperation with the US Department of Agriculture to determine the feasibility of using fly ash as a pesticide carrier.

66-0501

Carrique, C. S., and L. U. Jaurequi. Sodium hydroxide recovery in the textile industry. In Proceedings; 21st Industrial Waste Conference, Lafayette, Ind., May 3-5, 1966. Purdue University Engineering Extension Series No. 121. p.861-868.

Industrial wastes in the Castelar Textile Mill, Argentina are discharged through a collecting system completely separated from the sewage and storm collector drain. The wastes have a 2 percent sodium hydroxide concentration due to the mercerizing of cotton yarn process. This represents an important loss of a very valuable alkali. At the moment of discharging this effluent into the industrial wastes collecting system, the influent to the treatment plant has a considerable increase of alkalinity and consequently increases the consumption of alum. These facts have prompted the segregating of this waste and subjecting it to a physical process to recover sodium hydroxide. A 'double effect evaporator' system, complemented by filtration, was found to be the most efficient process. Hourly data recorded during the running of the sodium hydroxide recovery units are tabulated. The total amount of sodium hydroxide recovered daily (18 hr per day) is 360 Kgm per day. Annual profits using this system are estimated.

66-0502

Carson, B. How to control an industrial salvage program. Paper Trade Journal, 150(37):60-61, 1966.

To determine whether a part should be salvaged or replaced in an industrial plant, it is necessary to exercise systematic control over the salvage program. The various factors governing this control are discussed: (1) cost of replacement parts; (2) cost of salvage supplies; (3) cost of salvage labor; (4) life expectancy of salvaged parts as opposed to that of new parts; (5) market price for scrap; (6) the value of the space required to house the salvage shop; and (7) an accurate means of collecting and reporting costs incurred. A sample of a monthly salvage maintenance cost report is presented. It is concluded that efficient operation of the salvage handling procedures and records can mean substantial savings for mills, while promiscuous salvaging of parts and supplies is as bad or worse than sending this used equipment directly to the scrap yard.

66-0503

Centrifugal separators for aluminum chips. Waste Trade World, 108(5):12, 1966.

The collection by a specially engineered arrangement of self-contained centrifugal separators, of some 2,800 cu ft of aluminum chips, which is the daily volume of scrap metal generated in a massive numerically controlled profiling operation, is described. Each of the 14 three-spindle Cincinnati vertical profilers that machine aluminum work pieces in the factory, one of the country's largest airframe and space vehicle manufacturers, is serviced by a Torit separator whose control of the continuous flow of chips prevents accumulation problems. An ingenious hooding system, which pipes the chips to the collectors by means of an air velocity of 10,000 ft per minute at the face of the hoods, was developed. The collectors are powered by 25 hp motors which deliver air at the rate of 4,500 cu ft per minute at 20 in. water gauge static pressure. Pneumatically controlled loading doors simplify the task of loading the hoppers twice a day. Advantages of the separators include a high degree of efficiency, a noticeable increase in the sale value of scrap aluminum because of the uncontaminated condition in which it is collected, and cleaner air in the immediate vicinity of the profilers.

66-0504
Chinese communist regime exhorts people to save trash. Refuse Removal Journal, 9(3):24, 1966.

The Free China Weekly reported that people on the Chinese mainland are instructed to collect such items as worn-out clothing, old rags, bones, human hair, broken bottles, scrap paper, steel, iron, wood, and leather. They are told that by so doing, they will contribute to the 'socialist construction of the country'. An editorial in a Peking newspaper urged all people to 'labor diligently to recover waste and used materials, and to sort, process, repair, and remodel them'. In spite of the government's exhortations, the mainland people seem to be lukewarm to the drive. However, Shanghai, one of the cities to respond to the rubbish collection crusade, is reported by its 'Waste and Used Material Company' to have collected more than 2.63 million tons of scrap iron and steel. It was said that this would provide 2.18 million tons of 'good steel' when reprocessed. One of the more interesting items mentioned by the 'Company' was the export of more than 5,000 tons of human hair and waste. Other waste items reportedly collected in Shanghai included one million tons of miscellaneous bones, rags, and paper to be used for the production of paper.

66-0505
Communal scrap sites to stop Council chivvying. Waste Trade World, 109(12):5-6, 1966.

A suggestion by one of the members that Pennistone Rural Council establish one large scrap area and thus centralize the operations of the scrap dealers was praised by Mr. Hughes, the secretary of the Waste Trade Federation. Concern was expressed that smaller merchants, who nevertheless play an essential part in local industry, are being constantly harried by County Planning Departments because their type of trade is generally considered highly undesirable. Merchants have difficulty finding areas which are conveniently located for business and yet where the rent is low enough to suit the narrow profit margins in the trade. The problem of the small scrap dealer exists throughout much of Great Britain. The Ministry of Housing and Local Government sent out a circular to all local Councils pointing out the important task such merchants are performing and urging that they make every effort to provide sites. Potential areas might be ones already disfigured by industrial development. The Ministry also points out some of the definite rights of the small waste trade merchant, such as after four years' occupation he can claim to have 'established an existing use' and it becomes a lengthy procedure for authorities to force him to move. One objection to a communal site for the smaller merchant is that he is highly individualistic and may object to sharing a site with competitors.

66-0506
Cost of pollution control demands sensible use of salvaged waste. Compost Science, 7(2):2, 1966.

A company can turn high cost pollution control into a profitmaking situation. A compost fertilizer plant in St. Petersburg, Florida, will be using garbage as a raw material. Monsanto will extract sulphuric acid from noxious gases inside the stacks of a power plant. An Iowa packing plant fattens cattle with paunch (which was previously dumped into rivers) from slaughtered cattle. Filtering devices in a grain elevator collect grain dust and compress it into pellets. By selling the pellets as cattle feed, the concern expects to earn back the $750,000 cost of the dust collecting equipment within five years.

66-0507
Derrickson, G. F. Iron and steel scrap consumption problems. Washington, U.S. Department of Commerce, Mar. 1966. 52 p.

The Iron and Steel Scrap industry is examined in detail as to origin and use of the scrap. The members of the industry and the consumer of the scrap are described and the problems delineated. The economics of scrap origination, supply, and demand, and the estimated scrap usage for 1970 and 1975 are estimated. Scrap, which is mainly automobile bodies and presents a problem in aesthetics and in disposal, is considered and conclusions and recommendations for improving the industry and for eliminating the waste associated with automobile bodies are made. Appendix tables contain production, consumption, and export data, and 41 consulted sources are listed.

66-0508
Dump site reclamation practices vary widely. Refuse Removal Journal, 9(2):38, 1966.

The results of a survey by the Ohio Municipal League concerning the metal salvaging procedures of Ohio cities are described. Out of 146 answers received, 124 municipalities did not operate sanitary landfill or did not salvage any scrap metal. Seven Ohio municipalities, however, indicated that they entered into contracts for the salvage of scrap metal with private firms and persons, and five salvaged and sold scrap metal as a city operation. As an example, Columbus earned $3,200 in 1964 from metal salvage by the city. Toledo, on the other hand, has contracted for salvage of scrap metal and the contractor pays the city $225 per month for salvage rights. Since Toledo is converting from dumping to sanitary landfill it may not continue the present arrangement, as it is doubtful that salvaging can be accomplished without interference with the proper operation of sanitary landfill. A table lists data for seven cities which contract for scrap metal salvage and five which engage in municipal salvage operations.

66-0509
Dust control in baling waste paper. Waste Trade World, 108(13):12, 1966.

New dust control equipment was installed at the public refuse pulverizing plant at Stafford. Dust arising at the reception hopper and at the transfer point of the moving bottom plate to the main elevating belt, is effectively controlled by an MG. 160 wet deduster plant, handling 16,000 cu ft of air per minute. The self-induced spray zones within the unit give a very high collection efficiency and the collected dust is ejected by a drag link conveyor in wetted form for disposal by periodic emptying into the main receiving hopper. Three Unimaster unit dust collectors were installed to serve the picking belt area and one to deal with the fine dust emitted from the paper baling press. These units feature the incorporation of patent Fulimatic controls, which ensure that the filters are cleaned automatically every time the fan is switched off, thus maintaining optimum performance.

66-0510
Electric power from sugar cane waste. Waste Trade World, 108(13):10-11, 1966.

Generation of electrical energy from bagasse (sugar cane waste) is one industrial topic which is certain to be discussed at the current Leipzig Spring Fair. An increasing interest in steam power stations, which are attached to industrial plant, generating energy as a by-product of the steam required by the plant, is reflected in a scale model shown by V E B Kraftwerksbau EKE, Berlin, which illustrates a typical project layout. Profitable power stations are urgently needed by countries which grow sugar cane on a large scale and also have sugar processing industries. Such power stations have been installed by East German authorities in Indonesia and the U A R. The size of installation adopted has been such that a can sugar factory with a daily capacity of 5,000 tons of sugar cane is supplied with both production steam and electric power. During the season, the steam generators mainly use bagasse or cane trash as it is sometimes called. Oil can be used when cane falls short. Capacities of two proposed new steam generators will be 45 tons per hr each for waste bagasse heating, or 56 tons per hr each for oil heating.

66-0511
'Electrobale' baler. Waste Trade World, 108(5):13, 1966.

A number of improvements have been made in the design of the Electrobale baler and, according to the manufacturers, the price has been reduced to Ł260. The machine can be left to operate itself in complete safety, which enables the baling material to be assembled while a bale is being produced. The bale is 30 by 30 by 14½ in., but this can be reduced either by a suitable platform or by the addition of extended racks. The average bale is produced within 6 minutes with no operator fatigue. About two tons of cardboard can be baled a day by unskilled labor. The machine is suitable for use with a wide variety of materials ranging from cardboard to turnings. It occupies 8 sq ft of floor space and has a total volume of 19,100 cu in. It is supplied with all the necessary accessories which include an overload protection mechanism, safety switches, and guards.

66-0512
Electrobale baling machine. Public Cleansing, 56(8):421-424, 1966.

A baling machine is described which can be operated with push-button simplicity, and can be left to operate itself safely. Baling material can be assembled by the operator while a bale is being produced. There is an automatic return mechanism. A wide range of materials can be baled: cardboard to turnings. The bale produced is 30 by 30 by 14½ in. It occupies 8 sq ft of floor space and costs Ł260 F.O.B. It takes about 6 minutes to produce a bale. Two tons of cardboard can be baled in a day with unskilled labor.

66-0513
An essential industry. Waste Trade World, 108(25):12-14, 1966.

The proceedings of the National Association of Non-ferrous Scrap Metal Merchants at their annual luncheon in London in June 1966 are reported. The Rt. Hon. George Darling, M.P., Minister of State, Board of Trade, paid tribute to the vital importance of scrap metal recovery and processing operations and declared it an essential industry. In 1965, 40 percent of the copper used in British industries, over 33 percent of the aluminum, and about 25 percent of the zinc was derived from scrap, which if imported would have cost at least Ł200,000,000. Other comments concerned the frustrations of merchants due to 1965's fluctuating metal prices, temporary Government restrictions on copper exports, the Government's desire to keep the import bill for non-ferrous metals as low as possible, and close contacts between the board of Trade and the scrap metal industry. The new president, Mr. R. W. Coley, commented on the speech. The report of the retiring president, Mr. S. Sternberg, is summarized. It includes such topics as government policies affecting the nonferrous scrap metal industry and the almost total ban on export of non-ferrous scrap.

66-0514
Fine, M. M., and C. Prasky. Magnetic roasting of iron ores with ferrous scrap. U.S. Bureau of Mines Report of Investigations No. 6764. [Washington] U.S. Department of the Interior, 1966. 23 p.

The theory, experimental procedures, and the result obtained to date in the development of the Bureau of Mine's process for magnetically roasting iron ores using scrap iron as a means of reduction are described. Since magnetic separation is an operational step common to magnetic taconite plants, the preliminary research studies emphasized only the novel magnetic roasting step. The studies included the use of automobile scrap, ferrous reductants such as borings and turnings, and prereduced pellets. Technical feasibility of the process was demonstrated both on a bench and pilot-scale. Quality magnetic concentrates with recoveries of over 90 percent were obtained from a direct shipping ore containing 59.5 percent Fe and from fine grained semitaconites with about 30 percent Fe. Although questions remained unanswered, the use of scrap iron as a magnetic reductant is a promising, technically feasible process that may aid both the iron ore mining industry and the scrap iron industry.

66-0515
Fontenot, J. P., et al. Value of broiler litter as feed for ruminants. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.105-108.

In an effort to find a productive use for poultry litter (excrement), a series of experiments was conducted at the Virginia Agricultural Experiment Station to study the value of broiler litter as a feed for ruminants. After examination and determination that the protein and energy value of the litter was at least as high as that of other commonly used fattening feeds (digestible proteins, 22.7 percent; digestible energy, 2440 kcal per kg; metabolizable energy, 2181 kcal per kg; and TDN, 59.8 percent), steers were put on chicken litter diets. It was found that rate of gain and carcass grade were not significantly different for steers fed mixtures containing 25 percent ground peanut-hull or woodshaving broiler litter than for those fed a conventional fattening mixture.

66-0516
Fork lift trucks. Waste Trade World, 109(21):17-20, 1966.

In the selection of a forklift truck a buyer should consider that height, speed, and carrying loads of these trucks suitable for use in scrap yards are mostly in the lower scale, while refinement in maneuverability is an important aspect. Maneuverability can be gauged on paper by comparing the ratio of turning radius to the width of the truck. They can be as close as 41:32 in. A table lists the relationship of lifting height to carrying capacity of some of the models currently on the market. The needs of the driver should be taken into account and the choice of accessories should be tailored to the type of work demanded of the truck. It is considered advantageous to hire a truck if the work fluctuates considerably, and also the experience gained from the hired truck will prevent costly mistakes when a truck is purchased. Names and telephone numbers of Fork Lift Hire Services are supplied. Proper maintenance of the machine is stressed. It is calculated that if a machine is not properly maintained, repairs are liable to cost 40 percent more and are required three times as frequently. The essential basic daily and weekly points of overhaul recommended by Coventry Climax are listed in a table.

66-0517
Fulkerson, F. B., and H. F. Robertson. Iron and steel scrap in Arkansas, Kansas, Louisiana, Mississippi, Missouri, Oklahoma and Texas. U.S. Bureau of Mines Information Circular No. 8289. [Washington], U.S. Department of the Interior, 1966. 52 p.

The Bureau of Mines reports information on iron and steel scrap in the South Central States. The States are defined as comprising Arkansas, Kansas, Louisiana, Mississippi, Missouri, Oklahoma, and Texas. The study was made to determine trends in processing, shipment, and consumption of scrap iron and steel. Most of the scrap was processed and shipped within 200 to 300 miles of consuming centers. Exports provide a principal outlet for dealers along the gulf coast. Most of the scrap that fills these orders is loaded onto freight cars at yards in Texas and Louisiana and is shipped to ports for direct transfer from railroad car to ship. The largest scrap operations are in or near large cities which are heavy scrap. One technological development in the iron and steel scrap industry is the use of large presses which can take complete automobiles with frames, wheels, springs, and other heavy parts still intact and reduce them to bundles. Shredding plants are in operation that reduce car bodies and other light scrap into flat pieces 4 to 6 inches in size. Various tables are given on operations, prices and costs, shipments, consumption and economic statistics.

66-0518
Government and scrap. Waste Trade World, 109(23):9, 1966.

The eventual status of the scrap industry is discussed, assuming that the Iron and Steel Bill will reorganize the steel industry. Those in the government who are antagonistic to every type of private enterprise will proceed from the control of steel production to the nationalization of the ore fields and ships and thence to the nationalization of the scrap industry with direct State control in view. It is indicated that nationalization of ports and harbours is almost a certainty and steel nationalization will give the government a hold in the chemical industry. Possible further labour troubles in the automobile industry will provide an excuse for State control there. A public opinion poll indicates overwhelming opposition to steel nationalization. It is concluded that every industry which has steel making or steel consumption as its base should watch developments. This is especially true of the scrap industry, which would be a logical step after steel production is nationalized.

66-0519
Greenbat baling presses. Waste Trade World, 108(19):9, 1966.

Greenwood and Batley Ltd. have recently enlarged their range of baling presses by the addition of hydraulic power-operated models for both paper and metals. These cheap and reliable balers are based on new designs. A BA hydraulic type model, suitable for paper, is illustrated. The load exerted on the bale is 1 ton and the approximate weight of the bale is 1 cwt. The press is simple to operate and requires little or no maintenance. The electrical equipment (1 hp) cannot be overloaded and paper can be placed in the box with no fear of excessive filling. Models with up to 100-ton pressure are available, as well as models specially designed to bale cardboard cartons.

66-0520
Growing chances for the small paper merchants. Waste Trade World, 109(20):3, 18, 1966.

Councils are beginning to look for smaller merchants to take on waste paper contracts, since surplus paper scrap sold at the right price means additional profit. To facilitate the collection of paper, a trailer for waste paper was installed behind the ordinary refuse vehicle and special collections were made from large businesses. Publicity of the savings a corporation can effect has helped to obtain the cooperation of the public in the separation of paper from domestic refuse. Experience shows that smaller councils can be persuaded to organize the efficient collection of waste paper and, if necessary, offer garbage men a bonus incentive scheme. Due to the high cost of transportation and delays caused by road congestion, the smaller paper merchant is more likely to be able to offer highly competitive prices for contracts with the perimeter councils.

66-0521
Hoppers cut scrap handling time. Ceramic Age, 82(10):58-59, 1966.

The use of self dumping hoppers to dispose of the 20 tons of scrap generated each day by the Alliance Clay Products Company, in 4 hr, is described. Prior to the use of the hoppers, the scrap removal required 32 man-hr per day with wheelbarrows. Four percent of the bricks break in the kiln during firing and the 8,000 broken bricks are sorted and thrown into the 1 cu yd hoppers which hold 250 bricks. The hoppers, shown in a picture loaded with broken brick, are picked up on fork lifts and hauled to the crushing shed. Another picture shows the hopper on the forks being dumped into the crushing shed, after which the empty hopper returns to the upright and is locked in position. The fork lift can pick up a hopper, transport it to the crushing shed, dump the hopper, and return to the kiln in 7 minutes. The hoppers are loaded 32 times a day. The wheelbarrows held 50 bricks and required 160 loads a day with each trip taking 12 minutes to the crushing shed, which was several hundred yards away. The bats are ground into a paving bed. Two hoppers are used at each of 4 kilns with one being transported and dumped while the other is being filled. Other hoppers are located at the loading docks to collect bricks which break while being moved or during storage. Hoppers are also for moving shale, sand, and other raw materials from storage to the processing area. The use of hoppers has cut labor costs at this brickyard.

66-0522
Hydraulic excavator in scrapyard operations. Waste Trade World, 108(5):12, 1966.

A Poclain TY 45 hydraulic excavator, purchased by Charles W. Ireland Ltd. as part of a complete modernization program for their Hamilton, Lanarkshire, salvage works, is now handling 60 tons of light scrap metal per day with its six-tine grab. It was purchased to feed their new baling machine, which produces a 120 lb compressed bale every 27 seconds, with sheet cuttings and various light steel scrap metals, including car bodies. When handling higher density scrap, the Poclain can handle around 500 tons per day. Charles W. Ireland reports that expected output figures have easily been achieved by the Poclain/baler combination with the Poclain still having a lot in reserve. Winget Poclain Ltd., of Coatbridge, Lanarkshire, responsible for marketing the Poclain range of hydraulic excavators throughout Scotland, supplied the machine, the first to be used for this purpose in Scotland.

66-0523
Hydro-washers boost wiping rag profits. Waste Trade World, 109(2):6, 1966.

In 10 years the washer extractor has brought about a revolution in the laundry industry. The extractor washes and hydros in one machine, eliminating the messy operation of transferring wet work. The wider use of these machines for rag and wiper washing is worth considering because of substantial reduction in production costs. Skilled labor is not required since the process is automatic. In a conventional laundry the average output per hour is about 500 lb per operator; with the new machines it is about 750 lb. Additional advantages include a reduction in waste of steam, water, and detergent, a lower labor turnover, and saving of space. The cost of a washer extractor of 100 lb dry weight capacity is about ₤3,200.

66-0524
Independent survey of British waste paper industry. Public Cleansing, 56(1):8-11, 1966.

Results of an independent survey commissioned by the British Waste Paper Association in April 1965 showed that total waste paper consumption in the United Kingdom has risen from 1.1 million tons in 1955 to 1.5 million tons in 1964. An increase to 2.6 million tons is expected by 1975. The bulk (90%) of the waste paper is made up of the eight principal packaging qualities of board; white chip board, unlined chip board, container middles and craft-lined chip board, etc. Domestic consumption of packaging boards in 1964 was 1.59 million tons, of which domestic production accounted for 1.03 million tons. The survey suggested that domestic consumption will rise by 500,000 tons by 1970 and is likely to increase to 2.75 million tons by 1975. Average waste paper content will continue to expand slowly over the next decade and on the basis of a fiber yield of 90 percent, the waste paper content is expected to increase from its current level of around 31 percent to 32 percent by 1970 and to 33 percent by 1975, with a corresponding reduction in the usage of woodpulp. In terms of tonnage this forecast means that with paper and board production reaching 6.62 million tons in 1975, the waste paper content of 33 percent will need an actual waste paper consumption of 2.42 million tons. A corresponding increase in export demand for waste paper from the current average of 110,000 tons per annum to 165,000 tons per annum will bring the total demand for waste paper in the United Kingdom by 1975 to over a million tons higher than the combined total of domestic consumption and exports, in 1964. The role of the merchants in waste paper is discussed. The report also deals with the collection of waste paper and states that in recent years Local Authorities have operated at a loss. The survey suggested that higher prices by paid to Local Authorities and in order to achieve this, the merchants should call attention to the uneconomic nature of their operation, and the resulting costs to the economy as a whole.

66-0525
Industrial salvage. Waste Trade World, 109(3):12, 1966.

Industrial Waste Disposals Ltd. provides a fleet of heavy trucks equipped with the Dempster container system to collect industrial wastes in South Wales. The waste is buried at one of five sites, each equipped with servicing facilities for their trucks, and with a total disposal capacity of more than 100,000 cu yd of waste per year. Industrial Waste Disposals utilizes every possible method to protect the public from contamination from their dumps. Some waste is buried more than 30 ft. below ground; other refuse is sprayed with costly industrial perfume to reduce its unpleasant smell. Waste which is a problem is laboratory analyzed to find a suitable chemical to counteract any unpleasant properties.

66-0526
Johnson, G. E., L. M. Kurka, A. J. Forney, et al. The use of coal and modified coals as adsorbents for removing organic contaminants from waste waters. U.S. Bureau of Mines Report of Investigations No. 6884. [Washington], U.S. Department of the Interior, 1966. 56 p.

Batch tests of coals and coal-derived materials were made to determine their effectiveness in removing organic contaminants (COD or chemical oxygen demand, and ABS or alkylbenzene sulfonate) from the final effluent of secondary treated waste waters. The adsorptive capacities of flyashes, coals, pretreated coals, commercial chars and coke were determined and compared with that of granular activated carbon. The coals, although not as effective as activated carbon, possess an economic advantage--they are relatively inexpensive and they can still be burned as fuel without any loss of fuel value after use. An hvcb coal was found to be one of the best, having one-fourth the capacity of activated carbon for COD, adsorbing about 4 percent of its weight. Some of the flyashes were quite effective, removing as much as 66 percent of the COD and 75 percent of the ABS present. The effectiveness of the flyashes improves with increasing carbon content. Coals pretreated by mild oxidation were ineffective as adsorbents.

66-0527
Keep-scrap-moving system yields big profits. Waste Trade World, 108(23):7-8, 1966.

An unusual family-operated scrap yard with a payroll of around 35 is described. The three characteristics that make it revolutionary are: (1) material is never stockpiled if orders are available; (2) all ferrous scrap is cleared within 24 hr of delivery and the bulk lies in the yard less than 6 hr; and (3) all the material arrives in the yard by truck and practically all of it leaves by rail. For processing the scrap, four balers and four shears are used, stationed the length of the yard. Three Jones mobile cranes, the vital link in the system, not only feed the shears and balers but load the processed metal into the waiting tail wagons. The yard handles over 3,000 tons of iron and steel a month and when the latest mechanization program is completed it will have an output potential well in excess of 6,000 tons. Concentration on mechanical-handling methods greatly speeds up off-loading and processing.

66-0528
Low-grade rag problems. Waste Trade World, 108(10):12, 1966.

During a meeting of the Metal and Waste Traders' Association held in London, the problem of disposing of low-grade rags was raised. The need for finding new outlets and for research was discussed. However, financing research is difficult and it was felt by one of the participants that one-man laboratory experiments are not sufficient. After various suggestions, it was decided that the committee would look into the possiblity of raising funds for research into low-grade rags.

66-0529
Magnetic filters. Waste Trade World, 108(13):10, 1966.

Magnetic filters with high density magnetic fields to be used as filter traps for hopper installations where ferrous scrap is a problem are described. Grate, drawer, and frame types are available for different kinds of hoppers and special types can be designed for other applications. The basis of efficiency is a series of cartridges with extremely dense magnetic fields which consist of permanent Alnico V magnets in hermetically sealed tubes. Baffle strips are positioned ahead of the cartridges to divert product flow onto the most powerful part of the magnetic fields, assuring maximum scrap removal. Grate type Bunting filters can be installed anywhere in the processing line where there is danger of scrap being introduced. Extremely small particles as well as larger bits are captured.

66-0530
Miller, R. The utilization of boiler furnace ash in power stations in Poland. Polish Technical Review, 13(3):32-33, 1966.

The utilization of boiler furnace ash, produced as a waste material in power production, is discussed. Reserach and industrial applications undertaken at present in Poland for ash utilization include: (1) production of building elements; (2) production of cement and mixed lime-ash and gypsum-ash binding materials; (3) road building and ground stabilization; (4) production of sintered aggregate; and (5) magnetite recovery. A table presents the estimated amount of ash produced in Poland from hard coal in commercial power stations and its estimated utilization in 1965 and 1970. The processes used in the production of cellular concrete, ash concrete and road building, are discussed.

66-0531
Miller, H. Use of secondary fibers.
Tappi, 49(5):117A-120A, 1966.

With the general market level of most grades of paper stocks close to that of 20 years ago, there is a problem in inducing commercial sources such as stores, printers, and paper converters to segregate and process paper rather than have it removed along with the rest of their waste materials. There is a tight supply in some grades of paper stock and reclaimed fiber. Paper stocks previously usable now have a limited market because of contaminants that interfere with the recovery of the cellulose fibers. The use of cost analysis and long range planning should be the basis of attracting paper stocks to the secondary fiber mills. In general, the paper stock dealers will be in a position to insure that the required tonnage of paper stock continues to enter the secondary market if the consumer will agree to long term arrangements for their requirements. Better information about costs and cost analysis may indicate areas that may lend themselves to cost reduction. Better scheduling of truck deliveries would cut costs by eliminating waiting time which can run from $4 to $12 per hr. A wider recognition of paper standards and strict adherence to grade specifications would decrease costs. Paper stock suppliers, mills, and commercial sources should cooperate to develop better long range planning, more effective methods of cost analysis, more automatic handling of stock, and information important to those interested in secondary fibers.

66-0532
Million dollar scrap.
Waste Trade World, 108(4):3, 1966.

A $2,000,000 research program, supported by the U.S. Bureau of Mines and earmarked for scrap and slag dumps, is described. The concern is almost wholly with auto scrap. The establishment of a demonstration scrap processing yard, in which a wide range of techniques for upgrading auto scrap will be tested, is proposed. The project that has been of most interest involves the use of scrap to change nonmagnetic taconites to magnetic iron ore material for steel-making purposes, with a demonstration plant planned for the near future which will work entirely with auto scrap. Other aspects of the program involve a study of the economics, technology, and marketing methods of scrap, aimed at reducing costs and increasing its value; the development of a convenient method for removing impurities by total oxidation to produce a synthetic ore for blast furnace use; the removal of impurities from melted scrap; scrap salvage by chemical processes; and production of mild steel from scrap in electric furnaces.

66-0533
Muir, G. Long-term outlook for the scrap metal industry. Waste Trade World, 109(19):4-6, 1966.

The demand for scrap metal has steadily increased with rising steel production in the United Kingdom. There are, however, steel-producing countries where increases in the production of steel have been accompanied by a reduction in the consumption of scrap. This is a very serious situation for the scrap metal industry and it has been attributed to loss of confidence in the quality and consistency of scrap offered for use. This emphasizes the vital importance of maintaining and improving the quality and consistency of scrap metal for conversion into new iron and steel. A chart shows the consumption of steelmaking scrap in eight areas in the United Kingdom from 1951 to 1964. If the steel industry is brought under national control, the country is divided into eight areas for administrative purposes as far as the scrap metal industry is concerned, and into ten areas for the steel industry. If a cheaper and better material than scrap were found for the production of iron and steel, 10,000,000 tons of scrap would accumulate within 6 months, posing an extremely serious national problem.

66-0534
New crucible furnaces. Waste Trade World, 108(18):9, 1966.

A new-style patented lip-pour, hydraulically tilted crucible furnace, suitable for melting scrap, zinc, lead, and other soft metals, is described. The furnace is specially designed for rapid melting with minimum oxidation of metal and the special design allows the whole crucible furnace to be lifted only 24-in. for complete emptying. The lift of the furnace is only 30 degrees against a normal 80 degrees in conventional furnaces. It is fired by means of a low-pressure burner underneath the crucible itself and from this blanket flame all waste heat passes into the top cover. It has a standard capacity of 1,500 lb for zinc, while other capacities go up to 3,000 lb. The main advantages of the furnace are: accurate temperature control; reduced metal loss and lower fuel consumption; silence in operation; choice of firing arrangements; no additional air from compressor required; fully automatic melting, maintaining, and starting; and it can be operated by unskilled labor.

66-0535
New crusher cuts costs by 50 percent. Waste Trade World, 108(2):20, 1966.

The Swarf, a new small crusher with a high output, was introduced by W. E. Burnand and Son, Ltd. of Sheffield. It can cut transport costs on treated scrap by as much as 50 percent. The machine, which is illustrated, is of Swedish design, is relatively silent in operation, requires little or no supervision, and drastically reduces the volume of turnings, thereby significantly increasing their scrap value. The manufacturer claims that its outstanding technical advantages include unique mechanical and electrical safety and anti-jamming devices.

66-0536
New 'Eldair' baler. Waste Trade World, 108(10):13, 1966.

Two new models of the Eldair range of hydraulic baling presses are described. The machines are said to handle all classes of light scrap, compressing it into finished bale sizes 12 by 12 by 4 in., or 8 by 8 by 4 in., in less than 42 seconds. The machines are fitted with Fraser monoradial pumps and control gear. They are of the double compression type with main and side compression rams, each of 90 tons capacity. The main frame is of heavy steel fabrication and the lid incorporates shearing blades, each with four cutting edges. Other features which make the machines able to withstand pressure, as well as the hydraulic system and optional extras, are described.

66-0537
New look for wastepaper salvage? Public Cleansing, 56(7):312-313, 1966.

A report by a Working Party of the Economic Development Committee for the Paper and Board Industry is reviewed. Demand for wastepaper is expected to rise from 1.6 million tons in 1964 to 2.4 million in 1970. The increased supplies must originate mainly in segregated wastepaper from household collections which remain largely untapped by local authorities. A degree of flexibility must be introduced into the supply system to absorb inevitable trade cycles, and incentives must be offered to local authorities, of guaranteed sales as far as possible. A guaranteed return must be provided to defray additional costs for equipment and other charges. A guaranteed datum tonnage on a long-term basis of 5 years or more should be contracted. Supplies above this would accomodate expected annual growth and might be subject to a different form of shorter term guarantee.

66-0538
New 'Personer' baler. Waste Trade World, 109(3):13, 1966.

The new model SP.27.J. baling press in the Personer range of hydraulic baling machines although originally designed to meet the requirements of the textile, waste trade, and associated industries, has wide applications in many other spheres where the necessity to wrap a bale prior to wire bonding is of primary importance. It is robustly constructed and is fitted with a 15 hp electric motor providing a maximum hydraulic pressing force of 30 tons. The finished bale, measuring 42 by 35 by 43 in., weighs approximately 1,200 lb according to the nature and the density of the material being baled. The operation of the press is described and an illustration showing the container in the loading position is supplied. The outstanding feature of the new machine is that it provides complete freedom for wrapping and wire bonding any baled material, both in sequence and individually, without hindrance from the baling box walls, while the hydraulic manipulation of the side walls obviates the severe manual effort of side wall removal and replacement encountered on similar machines.

66-0539

New refuse plant for Barrow-upon-Soar. Public Cleansing, 56(12):595, 1966.

A newly ordered refuse plant will cost £237,000 and will handle 70 tons of refuse per day, with an additional potential capacity of 110 tons. The cost includes a refuse handling and screening plant with salvage recovery and tin baling facilities, suction equipment for dealing with dust, an incinerator with trough-type grates, a dust trap, and brick chimney, together with the buildings.

66-0540

New uses for nylon, Waste Trade World. 108(18):8, 1966.

A new use for old nylon stockings, even if laddered, is claimed by an American firm of component makers, Redstone Arsenal, Huntsville, Alabama. The nylons are used as a reinforcement material for moulded plastic ordnance parts. Details of the technique, however, are not available. It is believed that nylon stockings make an ideal reinforcing material on account of their sheerness and fine mesh, and also because of their stretch properties. The feet are removed, the legs split and opened out and afterwards dipped in resin, spread over a mould and cured. The final result is a cheap and durable component.

66-0541

New wool process may benefit reclaimed fibers. Waste Trade World, 108(19):8, 1966.

Plans are being made for trials, under commercial conditions, of a new patented process for washing wool to cut out the possibility of further shrinkage after the material has been sold in the form of a garment. The process consists of a very light treatment in which the wool passes through a mild oxidizing agent in a weak solution of resin. There seems no reason why reclaimed fibers included in blends could not also be subject to this treatment. It is felt that the new process will enable wool to withstand, without shrinkage, any condition of machine washing which it would be likely to meet in pratical use. Unlike most treatments previously proposed or tried, it causes no deterioration of fiber strength and it requires only the use of chemicals readily available at comparatively small cost.

66-0542

Oparin, A. I. Biochemistry and the food industry. FSTC-HT-23-103-66. Washington, U.S. Army Foreign Science and Technology Center, May 1966. 14 p.

Use of enriched or reprocessed food wastes for animal feed is discussed. A method of making feed concentrates of vitamin B twelve from the mash of acetone and distillery plants was developed. The residues are fermented with methane-forming bacteria, then concentrated and dried. By this method 2.5 million tons of residues per year will be processed with an output of 60,000 tons of concentrate containing 2.5 tons of vitamin B twelve, which will meet the requirements of poultry and swine breeding. Also, a microbiological method of production of lysine on the basis of using food wastes of molasses and corn extract was developed. Extensive tests have shown that the enrichment of feeds by these two methods has caused increases in the weight of animals, thus providing additional meat products.

66-0543

Over $252 million exported by British salvage industries. Refuse Removal Journal, 9(4):45, 1966.

A spokesman for the British salvage industry urged industry not to discard used materials, since what is useless scrap to one firm may be raw material to another. To illustrate this point, four examples are presented. During 1964, over $4.6 billion worth of waste was recovered from British industry, and exports of scrap exceeded $252 million. Waste paper now forms 25 percent of paper and boardmaking raw material, saving the country an estimated $168 million a year in imports. Through the publication of the National Industrial Salvage and Recovery Association Bulletin, Industrial Salvage, it is possible to track down scrap bargains from a railway train to sawdust.

66-0544

Parks, B. A., Junkyards are necessary. Public Works, 97(12):72-73, 1966.

An Iowa planning specialist said that junkyards are needed; they are growing in both size and number. They affect the community's appearance. Communities can provide for locating junkyards by a special permit, so that the sites will be away from public view.

66-0545

Pasqualini, F. More scope for waste paper. Waste Trade World, 109(3):8, 1966.

The current boom in the paperboard industry results from greater demand for corrugated paperboard and folding cartons for packaging. Over the past 10 years, the continental packaging industry has exceeded the annual rate of growth of all other industries due mainly to changing patterns of retail distribution and a rising standard of living. The demand for packaging materials, containers, and machinery to produce them tends to be higher than the supply, with paper and paperboard products representing about 50 percent of the continental use of all packaging materials. The corrugated paperboard industry alone is expected to grow at the average rate of 9 percent per year until 1970. The folding carton industry is also growing fast because of consumer appeal requirements and the use of folding boxes for frozen-foods.

66-0546

Pernicious contraries—switch to attack. Waste Trade World, 108(24):21, 1966.

The British Waste Paper Utilization Council's annual report for 1965 reports three events: (1) the completion of a detailed survey of 13 groups of pernicious contraries affecting 39 grades of waste paper; (3) a breakthrough in pulping tab cards printed with magnetic ink 'clock tracks,' potentially a source of high-quality waste; and (3) the establishment of a technical panel to provide expert advice and facilities for testing suspected stock under mill conditions. The new panel will study the prospects of developing pulpable substitutes for pernicious contrary additives. The survey is based on an analysis of more than 92 percent of total waste paper usage in Britain and is to be followed by a series of reports dealing with the most troublesome groups of contraries. The Council has also investigated three new areas of nonpulpable waste: wet-strengthened web offset newsprint, computer joining tapes, and edge-coated tabulating cards.

66-0547

Pneumatic baler. Waste Trade World, 109(12):15, 1966.

A pneumatically operated version of the Hindle Imp electric baling press has been developed. A single lever controls platen travel which, combined with high platen speed, gives very efficient operation and much reduced maintenance requirements. Pressure is exerted by means of a double-acting air cylinder providing table pressure of 2¼ tons at 100 psi air supply. Speed of the return stroke can be varied to suit by adjustment of the exhaust ports of the fitted control valve. A pneumatic safety switch is included to prevent the press being run while the filling chute is open. The press chamber incorporates the standard Hindle Imp construction features. The press is ideal for the quick and efficient baling of waste paper, etc., and the uncomplicated drive arrangement ensures trouble-free operation and low running costs.

66-0548

'Poclain' excavator speeds scrap handling. Waste Trade World, 108(17):7-8, 1966.

The Poclain T.Y. 45, a versatile hydraulic excavator, can be invaluable in a scrap yard when equipped with a 40-in. diameter electromagnet and a 6-tine grab. The machine's 3-piston hydraulic pump supplies tremendous power and one of its major assets is maneuverability with road speed of

12 mph and a 360 degree slew at 8 rpm. It has a minimum turning radius of 15 ft 11 in. and works at a hydraulic pressure of 3,500 psi. Trials indicate that the converted Poclain can handle 3 tons a minute, although it will only need to handle 750 tons of mixed scrap a week—an increase of about 450 tons over the crane it replaces. Trials at three companies that have recently purchased the machine have fulfilled expectations.

66-0549

Profitable waste. Engineering, 201(5213):535, 1966.

Much, perhaps most, industrial waste has value. In some cases this is considerable and ever increasing. This fact has led to tips, once regarded as valueless, being sold at high prices for reprocessing. With the better means of recovery now available, much that was formerly waste, in the dictionary sense of the word, can now be used or sold. Saving and selling waste has a threefold advantage. It can constitute a source of income if the waste is sold, or a saving if it is reused; it can eke out world supplies, which in addition to becoming scarcer also become dearer; and it can avoid much of the unsightliness. Some idea of the vastness of the subject may be gained from the fact that reclamation of waste is reported to have saved the United Kingdom about Ⱡ1,650 million in 1964, and probably earned something like Ⱡ90 million in direct exports. If the best results are to be obtained, it is essential that the most modern techniques for recovering and reprocessing waste materials should be used. No longer is scrap and waste reclamation the casual occupation of the rag and bone man. It has become very big business; so much so, that it is to have its own exhibition, the Scrap and Waste Exhibition, at Olympia London, from July 17 to 21.

66-0550

Proler Cohen U.K. link-up. Waste Trade World, 108(19):6, 1966.

The development of the Proler system of scrap processing by Proler Cohen Ltd., is described as destined to revolutionize the scrap industry in Great Britain. The first Proler factory will be fully operational in 1967 and will almost immediately solve the scrap car problem. The Proler process of fragmentizing scrap produces a high quality material which affords not only uniformity of size and density but also guarantees a product of 99.9 percent pure ferrous content by eliminating all contaminating elements. All scrap fed into the plant is first broken up into pieces by intensive hammermill treatment, after which it passes through a phased operation of segregation, incineration, sterilization, and magnetization which removes all dirt and grime, nonferrous and nonmetallic elements, etc. Although auto scrap is its principal diet, the plant will process all pressable grades of lighter scrap. Since contaminated scrap has been the biggest problem facing steelmakers, the new process is of particular importance. The cost of installing the plant has been assessed at over Ⱡ1,000,000.

66-0551

Radimer, K. J., F. E. Caropreso, D. Goldstein et al. Recovery of persulfate from printed circuit etchants. Plating, 53(12):1445-1447, 1966.

Printed circuits are commonly etched with ammonium persulfate which forms copper sulfate and ammonium sulfate. A cyclic process has been developed for recovering the unused persulfate (30-50%) from the partially spent etchant by crystallizing out the products of this reaction in the equimolar amounts in which they are formed. The resulting mother liquor is refortified with ammonium persulfate and used for further etching. In developing this process, investigations were made of the effects of the temperature to which the spent etchant is cooled, the method of cooling used, the use of cold water to wash the crystals, refortifying before the crystallization, and use of spray and immersion etchants containing various solute concentrations at various temperatures. Tabulated data present characteristics in immersion etching at 38 C with crystallization recovery of persulfate, immersion etch rates as a function of dissolved copper concentration, preliminary cost comparison of present and proposed spent etchant treatments, and a schematic crystallization recovery process flow sheet. The process increases the amount of copper which can be etched per pound of purchased persulfate, produces a valuable by-product, eliminates the waste liquor disposal problem, and can reduce etching costs significantly.

66-0552

Ramakrishnan, P., and S. P. Nagarkatte. Recovery of tungsten from scrap. Indian Journal of Technology, 4(10):313-314, 1966.

The recovery of tungsten from high tungsten content scrap by anodic dissolution of the scrap is described. The experimental procedure consisted of connecting the scrap as anode and a mild steel plate as cathode in an electrolytic cell. Aqueous solution of sodium hydroxide was used as the electrolyte. The anode current density and the electrolyte composition were studied. Tungstic acid was precipitated from sodium tungstate solution by hydrochloric acid and the metal was obtained by the reduction of tungsten trioxide by hydrogen. The metal powder obtained was substantially pure (greater than 99.5%) and required no further purification. The current efficiency decreases with increase in anode current density, but increases with increase in electrolyte concentration, the maximum value being attained at 15 percent electrolyte concentration. Addition of potassium perchlorate (5 mg per liter) increases the current efficiency by about 15 percent.

66-0553

Regenerating waste rubber. Waste Trade World, 108(26):10, 1966.

The financial times, in its 'World Industry' section, reports a new technique for regenerating waste rubber, both natural and synthetic. This technique has been developed by Michelin et Cie, Place du Terrail, Clermont-Ferrand, Puy-de-Dome, France, and enables the waste rubber to be mixed with primary rubber for the production of components. After mixing the waste rubber with petroleum oil and adding coumarone oil and dixylyl disulphide, the mixture is heated for three hours at 195 C. The resultant solution is said to be suitable for adding to raw rubber and particularly useful for plasticising hard rubbers.

66-0554

Scrap metal salvage in Ohio. Public Works, 97(2):124, 1966.

The results of a survey conducted by the Ohio Municipal League to determine the feasibility of selling metal recovered from dumps and sanitary landfills are reported. The League polled 195 cities in the state. Of 22 cities that do salvage the scrap metal, six permit the facility caretakers to sell it and retain the proceeds as supplementary compensation, and three cities do not pay the caretakers anything, but allow them to have salvage proceeds in lieu of compensation. One city allows a salvage company to remove scrap iron in return for the company's willingness to remove other indisposable items without charge. Seven cities, including Toledo, enter into contracts with salvage contractors. Five cities, including Columbus, perform their own salvage operations and sell directly to scrap dealers at the market price.

66-0555

Wiley, J. S. Utilization of wastewater sludges and composts. Manual of practice No. 2. Water Pollution Control Federation. Sub-Committee on Utilization of Wastewater Sludges, [1966]. 115 p.

The first edition of Manual of Practice No. 2 (Federation of Sewage Works Association) was titled Utilization of Sewage Sludge as Fertilizer (1946). The connotation that most sludges and other organic wastes are fertilizers, is false under present usage of the term. As soil conditioners or mulching materials, these products are not classed as fertilizers in most states. The trend in thinking is towards the combined treatment of both water-carried and solid municipal wastes. The composting of organic municipal wastes is increasing and therefore the utilization of sewage sludges and composts is similarly considered in the revised manual. The public health aspects of the utilization of sludges and composts are reviewed as well as marketing and other economic considerations, and state regulations. A bibliography of 216 items is included. Notes on European Growing Experiments with Composts from the International Research Group on Refuse Disposal (IRGRD) Information Bulletin is included in an appendix.

SANITARY LANDFILL

66-0556

American Public Works Association. Sanitary landfill. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.89-139.

The choice of a method of sanitary landfill depends greatly on the availability of a proper site. The factors to be observed are public health and safety requirements, land requirements, availability of cover material, accessibility, drainage, future land uses, zoning regulations, and public acceptance. Measures to be taken or facilities provided in readying an area for sanitary landfill operations are listed. The preliminary engineering survey and site investigations specify the particulars of dry and wet landfills, and the requirements laid on equipment and personnel. Data reported by the APWA indicate that six men, on the average, are required for each 1,000 cu yd of refuse disposed of each day in a sanitary fill. The approximate needs for tractors with a front-end loader or bullclam are as follows: cities of up to 15,000 population need 1 unit of 1 cu yd capacity; cities between 15,000 and 30,000 population need 1 unit of 2 cu yd and cities between 30,000 and 75,000 population need 2 units of 3 cu yd capacity. Among the special problems discussed are winter operations and wet weather operations, the elimination of dust, odors and fire, and the hazard of ground and surface water pollution. Particular attention is drawn to the settlement and decomposition of the landfill, and several examples are presented of the good use of completed landfills.

66-0557

Bishop, D., R. C. Carter, and H. F. Ludwig. Water pollution hazards from refuse-produced carbon dioxide. Journal of the Water Pollution Control Federation, 38(3):328-329, 1966.

Concern has developed in Southern California over a potential groundwater degradation from sanitary landfill. Carbon dioxide from the decomposition of refuse, diffusing through the soil, is important in this regard because of its high solubility in water which tends to lower the pH and hence to increase the mineral content of the water. The velocity and quantity of movement of refuse gases in soil around a landfill was therefore studied and the results of observed field measurements of carbon dioxide movement were compared with theoretical calculations. At a test site in a gravel pit, gas monitoring probes were placed in the rubbish as it was dumped. Gas-sampling probes were installed in a pattern of holes in the surrounding soil. It was possible to determine the gas concentration at any depth or section of the refuse and to detect the movement of gases outward and downward. The carbon dioxide in the refuse reached 84 percent at a depth of 20 ft in a month and 60 to 70 percent at other probes and then declined slowly over a period of 2½ years. A table is given which shows that the theoretical compared to the actual concentrations for downward movement were of the same order of magnitude, with a 25 percent difference. For horizontal movement, the difference was 11 percent and for upward movement the observed results were from 3 to 5 times less than the theoretical calculations. Carbon dioxide was the only gas considered, because it was the only gas found in significant concentration in the surrounding soil.

66-0558

Black and Veatch, Consulting Engineers. Disposal by sanitary landfill. In Report on refuse disposal for Northern Baltimore County. Kansas City, Mo., 1966.

In the study area, northern Baltimore County, water pollution was a serious possibility in the sites considered. A high speed highway was available for transport of the refuse to non-populated areas and two considerations played a large part in selecting sites; desire for a site for long-term disposal for all refuse from the study area and an interim landfill site which would suffice until a permanent disposal facility could be provided. Topographical investigations were made to locate sites meeting the criteria of isolation, accessibility, capacity, drainage, and minimum water pollution potential. Field inspections and evaluations of sites were made and generalized analyses of soil types and depths were made. Preliminary filling plans and volume calculations were made for sites as well as estimates of hauling costs. Disposal costs were based on an assumed landfill operating cost of $1.15 per ton of refuse and did not include, for most sites, cost of an impervious seal below the rubbage. It was decided that long-range sanitary landfill in northern Baltimore County would be possible only under adverse conditions due to water pollution hazards and public reaction. Numerous charts and graphs covering most aspects of costs and suitability of the sites considered are given.

66-0559

Booth, E., and E. Carlson. Rubber tires work well on sanitary landfills. American City, 81(7):98-99, 1966.

Bismark, North Dakota had previously used a track type machine to spread and cover refuse at the landfill. It was found that a rubber tired machine could operate economically. Shredded steel wires are embedded in the tread and steel-cord layers prevent puncture by objects in the refuse. The only flats occurred during sub-zero temperatures where puncturing objects could not penetrate the frozen ground and were forced into the tire by the weight of the machine. Refuse collection operates on an incentive plan. When the truck finishes its collection, it is through for the day.

66-0560

Community tries to block reclamation project. Refuse Removal Journal, 9(9):34-35, 1966.

For nearly two years the city of Blue Island, Illinois and adjoining villages have been trying to prevent the creation of a sanitary landfill near their borders. Residents in these Chicago suburbs have claimed the pits were dangerous, unsightly, and pest holes, and have invoked a state law that forbids operation of disposal sites within a mile of municipal limits. John Sexton Contractor Company, a firm with a long record of successful sanitary landfill in the area has been forced to take legal action in order to operate at the site, which consists of 146 acres of gaping city pits still owned by Illinois Brick Company. Previous to Sextons' operation, the area was a 'casual' dump which was covered with all sorts of wastes, often ablaze, and rat infested. When Sexton began operation, earth cover was applied to eliminate most of the odor and to seal off the entire colony of rats. An attractive cyclone fence costing about $15,000 was also erected to hide the pit from the residential housing and from motorists. In a court injunction obtained by Sexton and Illinois Brick Company to restrain Cook County from preventing or interfering with the operation, procedures were set up for the operation of the sanitary landfill: 3 ft layers of refuse are to be overlaid daily with up to 1 ft of earth; a final cover of 2 ft of earth will be used at the end of the operation; no open fires are permitted. Furthermore, Sexton claims the landfill will eliminate the unsightly, hazardous area in 3 to 4 years.

66-0561

Create joint landfill to serve nine contractors. Refuse Removal Journal, 9(9):24-28, 1966.

Nine private contracting firms have combined to create a sanitary landfill company, called Acme Sanitary Landfill Corporation. Located in Martinez, California, this corporation operates about 800 acres of San Francisco Bay area lowlands, and is one of the largest landfill operations in northern California. The firm uses three special pieces of large equipment: a Cat D8H crawler, used for primary spreading of refuse; a Pactor series 2 model 3-40 Trashmaster for compaction and spreading; and a Euclid TS-14 twin-diesel, self-loading scraper to load, haul, and spread over dirt. Household refuse is also processed through a sorter which removes about 350 tons of tin cans per month. This can-salvage operation results in saving dump space and leaving a material that compacts easily into a higher density state. Community relations, fill-area conservation, operational efficiency, and minimum capital investment are considered to be crucial factors in the operation of this landfill and are used in the determination of rigorous operating specifications.

66-0562

Demonstration program on solid wastes landfill. Public Works, 97(9):86, 1966.

The U.S. Public Health Service has awarded $181,300 to the city of Santa Clara and the Ralph Stone and Company, Inc. in order to engineer improved methods of sanitary landfill design for disposing of industrial and domestic type solid wastes. Emphasis will be placed on evaluating accelerated refuse decomposition and planned land use.

66-0563
Disposal creates problem for contractor. Refuse Removal Journal, 9(11):28-29, 1966.

The disposal problems encountered by refuse collection contractors in Minneapolis are described. As an example, the operations of the firm of Art Willman and Son, which hauls scrap, general refuse, and burnt sand from foundries, are given. Since the Minneapolis incinerators will only accept specified types of refuse from contractors, the firm had to make its own disposal arrangements. A temporary arrangement has been worked out with the Northern Pacific Railroad whereby Willman and Son pays one dollar a year for the use of an area leased from the railroad until the railroad does not want any more clean fill. However, additional sanitary landfill sites are essential in the near future, and due to a long history of open burning dumps in the suburbs, the residents take a dim view of accepting waste material near residential areas. The Minneapolis and Suburban Refuse Associations are now making an attempt to solve the problem. Under consideration are the following measures: (1) a jointly operated disposal operation; (2) a campaign to educate communities about the need for efficient and economical sanitary landfill; and (3) closer cooperation with municipal officials to work out area-wide plans.

66-0564
Disposal fantasy pokes fun at public's vision of landfill. Refuse Removal Journal, 9(3):16, 1966.

A humorous account of how a landfill site should look to receive acceptance by the public is presented by a columnist is the Seattle Times. This article was brought about by the fact that Seattle had many headaches over a landfill site, since residents in the proposed area always objected and threatened to sue. The importance of the social, aesthetic, and recreational aspects of a landfill site are stressed, and it is recommended that the disposal area be disguised by beautiful landscaping and incorporate a social hall, park and museum. The columnist concluded that the cost of preparing the site will be offset by the fact that many more homeowners will want to haul their own refuse just to socialize at the dump, thus reducing the present municipal collection load.

66-0565
Do you need a sanitary landfill? Public Health Service Publication No. 1012. Washington, U.S. Government Printing Office, Nov. 1966.

A residential development is illustrated which was begun after full-scale sanitary landfill operations had been conducted for 2 years. When completed, the Mission Canyon Site in the Santa Monica mountains of West Los Angeles will become a country operated regional park. Lots adjacent to the landfill are selling for $30,000 to $35,000. The method of operation of a sanitary landfill is also illustrated. In low swampy sites, earth cover is taken from the sides or hauled in from nearby. A tractor is used to spread, compact, and cover the refuse. A final 2 ft earth cover provides a seal for the completed cells. In level areas, a trench may be used. One crawler tractor equipped to move earth can handle all refuse from an average community. The cost of using sanitary landfills averages 50 cents per year per person.

66-0566
Exotic dump to change. Refuse Removal Journal, 9(6):22, 1966.

While the Hilo city dump in Hawaii is covered with bamboo orchids, hibiscus, wood roses, papaya and banana trees, it is smelly, smoky and fly-infested. County engineer Hajime Tanaka aims to clean it up, using sanitary landfill methods. He has tested land and waste material and proved that lava material not so hard to work as had been assumed. He has produced figures that indicate sanitary landfill might even be cheaper than the open dump to maintain. Providing for about 37 tons of refuse daily, the cost of a bulldozer and operator comes to $1.59 per ton, about the same island-wide as the cost on the mainland where earth is often softer. His plan calls for changing the old dump to a trench method landfill and use of four central disposal districts and 8 refuse transfer stations. The plan means that many small open-burning dumps will be closed, leaving only strictly supervised operations. Bulky items, such as cars, refrigerators and stoves may be dumped in the Pacific Ocean, perhaps to form a breakwater.

66-0567
From garbage to golf. American City, 81(1):20, 1966.

Two golf courses of 210 acres lie atop refuse deposited on low salt marshlands. The top soil covering these courses is synthetic, manufactured by mixing dried sewage sludge and sand. Fifteen hundred acres of parkland are on sanitary landfill sites.

66-0568
Haulers find own solution. Refuse Removal Journal, 9(6):6, 1966.

The municipal landfill crisis in Denver is discussed. The city has moved to conserve the little nearby dumping space in its municipal landfill by barring all private contractors from using its facilities. Now commercial haulers have had to turn, practically overnight, to privately operated landfill in the surrounding counties or use the new municipal project on the old Lowery Air Base bombing range. Commercial haulers, who service commercial estalishments and large apartment houses, may now choose to pay to dump at a newly opened landfill near the city, but the fees ($0.25 per cu yd) appear high in this competitive business. Denver has also halted the city transfer station program. A serious crisis is imminent since two of the five municipal landfills near Denver will last a year, while one will be closed shortly and the others in 4 to 7 months.

66-0569
'Instant landfill.' Public Cleansing, 56(6):306, 1966.

An 'instant sanitary landfill' machine is described. The machine was specially designed to excavate an 8 ft by 42 in. trench, compact the refuse, extrude it into the bottom of the trench, and backfill and compact the excavated earth in a continuous operation. It can process up to 10 cu yd of refuse in three minutes or less. The machine is self-contained and self-powered and is operated by two men. One engine is used to provide propulsion and control, the other to operate the refuse compacting and extruding equipment.

66-0570
Landfill and hospital live in harmony. American City, 81(5):38, 1966.

A new landfill operation, called 'Disposal Gardens,' in San Pedro, California, is described. The landfill is taking place on the site of an old brickyard which had been an eyesore for years. The open-wire fence surrounding the former brickyard was replaced by a solid bamboo barrier to screen the site from public view. The area in front of the fence is landscaped and behind it there is strict control of pests, odors, and smoke. Filling will be complete in less than one year. The site will then get a thick layer of topsoil. landscaping, various recreation attractions, and a paved parking area. Work crews wet down and compact tightly every bit of refuse that goes into the landfill. The area is sprayed regularly to eliminate insects and is baited to prevent rodents. This operation has been so nuisance free, and the results so attractive that a hospital just 100 ft away and the local chamber of commerce are overjoyed with the operation.

66-0571
Leader in rubbish industry began career in pawnshop. Refuse Removal Journal, 7(7):8, 1964.

Marshall Rabins, a former pawnbroker, has been successful as owner of a Los Angeles collecting firm, the Yellow Barrel Company, and as president of Sunshine Canyon Corporation, which is filling up a canyon with rubbish for conversion to a recreation center. Sunshine Canyon is cited as a model sanitary landfill. The growth and operation of the companies are described.

66-0572
Medley, H. When streets and buildings settle. American City, 81(3):32, 1966.

The experience of the City of Midland, Texas, which constructed a municipal garage, a warehouse and a service center for the street, park and traffic departments on a landfill about ten years ago, is related. The buildings have required continuing repairs because of settlement and one section of the street is slated for complete rebuilding. All structures are one story without basements. Footings supporting the walls have settled unevenly, causing cracks. In one case, excavation along the side of the foundation with consequent pumping of mortar in the gaps under the footing, was necessary to save the wall. Part of the adjacent bituminous street has also settled badly and water now stands several inches deep in the gutters after a rain. The estimated quantities and type of work necessary are: (1) excavation and replacement of 5,000 cu yd of material; (2) removal and replacement of 700 ft of curb and gutter; and (3) removal and replacement of 2,000 sq yd of asphaltic-concrete surface. It is concluded that it is not impossible to build on landfill sites, but it requires extra care and expense, either during construction or later. Excavation of enough unstable material in order to prevent serious settlement is essential.

66-0573
Meet landfill oppposition with facts. Refuse Removal Journal, 9(10):10, 1966.

Public resistance to locating a sanitary landfill site within a community is inevitable and expectable, but it is generally possible to educate most municipal officials and a good part of the public. A thoroughly planned and engineered sanitary landfill will not create harmful environmental effects, but the contractor or municipality must operate the area according to the highest standards. Furthermore, useful land is ultimately created by sanitary landfill.

66-0574
Merz, C., and R. Stone. Sanitary landfill behavior in an aerobic environment. Public Works, 97(1):67-70, 1966.

During construction of the aerobic cell, an access well was erected in the center of the cell to provide outlets for gas collection lines and electrical leads, and a means of human access for placement of equipment as well as the taking of data. A system of piping by which air could be admitted to the completed cell was installed. During the one year study of the cell, the aerobic landfill was operated so as to minimize fire hazards by controlling the oxygen and carbon dioxide concentrations and the moisture content. It was found that: (1) the first year rate of settlement in this aerobic landfill was over four times greater than for an anaerobic landfill of comparable construction; (2) a nitrogen content in excess of 70 percent was characteristic and carbon dioxide concentrations amounted to about 20 percent; oxygen concentrations normally ranged between 2 and 6 percent at the upper levels of the landfill, and between 10 and 15 percent at the lower levels; (3) gases discharged from the interior of the aerobic landfill to the atmosphere had a very objectionable odor; (4) temperature varied between 110 and 190 F, and (5) further study is needed for evaluation of long-range and variable aeration cycle effects.

66-0575
New York to build light plane air strip on old disposal site. Refuse Removal Journal, 9(11):46, 1966.

As part of a long-range plant to make the west shore of Staten Island into an industrial park, New York City plans to use a section of the 3,000-acre Fresh Kills landfill there to create a new airport for small private planes and light cargo aircraft. Construction is likely to begin in 1967 and be completed within 18 months. Refuse is taken daily on barges to the Fresh Kills disposal site, and then transferred to dumping containers which are towed to the landfill area. The 120-acre site will provide enough filled area for only one runway.

66-0576
Plans to mould landfill into hills for parks and stadiums. Refuse Removal Journal, 9(11):42, 1966.

The Virginia Beach City Council has endorsed a proposal for a 60-ft high hill which would be formed of trash into the shape of a 5,000-seat amphitheater. A ramp running down one side could be used for Soap Box Derbys. Roland E. Dorer, Virginia Director of Insect and Rodent Control, has built a model of such a hill; it would take 20 years to build in a city of 150,000 and would rise 125 ft into the air. The most important factor in building such a mound would be the use of landfill machines which compact with heavy pressure as well as bulldoze waste material. This hill-building disposal method would be slightly more expensive than landfill, but less expensive than incineration.

66-0577
A practical sanitary landfill study is underway. American City, 81(9):36, 1966.

Santa Clara, California, received a grant of $181,300 from the Office of Solid Wastes to improve sanitary landfill procedures of accelerated refuse-decomposition process and planned land use.

66-0578

Williams, E. Rates, costing and operation of tipping vehicles. Waste Trade World, 109(23):14, 20, 1966.

At a recent Tipping Vehicle Convention in Buxton, England, Mr. Edgar Williams mentioned the necessity of knowing costings of services so that a justifiable rate can be obtained. Standing costs and running costs in the operation of dumping vehicles constitute the two broad categories involved. Standing costs include the purchase of the vehicle and its anticipated life, annual road fund tax, insurance, establishment charges, and interest on capital. As soon as a vehicle is used, running charges are incurred which include fuel, tires, and maintenance and repairs, with adequate records kept of mileage, fuel consumption, etc., in order to assess these charges. After calculating the cost of operation, it is then necessary to apply these calculations to a rate. Some factors involved in planning operations to achieve greater productivity are mentioned, such as return loading, double shift working, or more extensive use of vehicles. The importance of planning in order to run a successful operation is stressed, with setting the rate the last step in the process.

66-0579

Xanten, W.A. Refuse disposal-site location problems. In Proceedings; First Annual Meeting of the Institute for Solid Wastes, Chicago, American Public Works Association. Sept. 13-15, 1966. p.16-18.

The question of site location for refuse disposal facilities has always been a serious problem for communities. Pollution of ground water may be prevented by limiting the disposal of liquid and toxic wastes to sites where the topography, geology, and hydrology preclude the possibility of their entering water supply and by requiring decomposable refuse landfills to be so constructed and maintained that water cannot enter the fill in sufficient quantity to cause leaching. With haul distances to landfills from core areas of large cities becoming longer and longer, hard decisions are required regarding the necessity of transfer stations or pre-processing plants and methods to achieve volumetric reduction prior to shipment. It is recommended that for future progress in this field of site selection, state-wide and/or regional standards and controls for landfills be established.

STREET CLEANING

66-0580

By night - Glasgow steps up 'after dark' service. Public Cleansing, 56(6):269-270, 1966.

Of the nineteen cleansing districts in Glasgow, eleven are operated on a twoshift principle. The two-shift districts are those in the most central parts of the city, which include the main shopping and business centers, and where the bulk of the older tenement and apartment properties are situated. Recruitment for the second shift was difficult until the introduction of the enhanced payment for night-shift workers. The increase in cost is relatively small in relation to the quality of the service now provided. The success of the incentive system has led to the following recommendations: (1) that the night-shift collection services be continued and developed so far as possible on a time-work basis in order to get the best economical returns from vehicles and disposal plant; (2) that an extension of street cleaning services on night-shift should take place, and that a survey should be carried out to determine whether alternate parking on either side of certain streets could be introduced to permit a better use of mechanical street cleaning vehicles; (3) that a greater proportion of maintenance work be carried out during the night hours, especially in relation to the inspection and lubrication of vehicles and essential repairs to the disposal plant; and (4) that twelve large gritting machines (each of 15-ton capacity, capable of spreading salt or grit, and provided with snowploughs) be purchased, along with three mechanical shovels for service in areas on day-shift operation only.

66-0581

City cleaning. Staedtehygiene, 17(6):139, 1966.

Since the costs for city cleaning increased annually by more than 2 million DM, the city of Freiburg, West Germany, launched a campaign to solicit the cooperation of the residents to keep the streets clean. An extra leaflet was attached to the newspaper explaining to the readers that they make themselves subject to a fine of 150 DM or 14 days of imprisonment when they litter the streets and squares with paper, food remnants, broken glass, etc. Police regulations request that downtown city residents clean the pedestrian walks and street gutters daily from Monday through Friday and twice on Saturdays. For the rest of the city area, street cleaning is confined to Mondays, Wednesdays and Saturdays. But, as the leaflet went on to say, not police regulations and fines should make the residents obey, but a deep desire to have a beautiful city. (Text-German)

66-0582
Covert, D. Leaf collection made easy and economical. Public Works, 97(3):94-95, 1966.

Harrington Park, New Jersey, designed its own leaf collector by using a large dump truck and a 'Giant Vac' leaf-loader mounted in the dumpbody just behind the cab. The leaf container is a bottomless plywood box 7 by 7 by 10 ft. The discharge chute of the suction unit was directed into the box. Full doors at the rear of the container facilitate unloading. Dumping the leaves was easy; a few tugs with a garden rake were all that were necessary to cause the packedload to slide out.

66-0583
Matveev, P. N. The cleaning of below-ground installations of underground railways (subways). Hygiene and Sanitation, 31(1-3):247-248, 1966.

The importance of effective cleaning operations in below-ground installations of underground railways is stressed in relation to air pollution and rodent control. A system for cleaning refuse, with reference to the subways of Moscow and Leningrad, is described. The best method is mechanical sweeping and floor washing by means of special machines and dust removal from walls by means of vacuum cleaners. If machines cannot be used, a system of collection and disposal involving two types of garbage containers is outlined. Brief suggestions for transportation to surface, disinfection, amount of equipment, number of staff, and management of the cleaning operation are made.

66-0584
Oschlies, D. Today's waste disposal and street cleaning trucks. Staedtehygiene, 17(6):129-133, 1966.

All modern waste removal trucks today have pneumatic or hydraulic tilting devices by means of which the standardized trash cans can be emptied completely dustfree. The Haller trucks have an opening in the rear wall of the truck through which the waste, aided by a transporting wheel, falls over an obliquely-arranged wall into the interior of the hull. The piled up waste cone is distributed and compacted by a helix hanging down from the top. With the Kuka trucks the waste falls first into a bucket wheel which lifts the waste onto a sliding board leading into the interior of the truck. The waste is then spread out and compacted. The large containers with a capacity of 1.1 to 6.6 cu m can be removed by any truck designed for bulky waste. Tilting devices of 1.1 cu m can readily be installed. However, for heavy industrial waste it is more economical to drive the full container away and to replace it by an empty one. The companies Haller, Kuka, Magirus and M.A.N.-Ochsner make special trucks for crushing, compacting and removing bulky waste. Street cleaning vehicles must be especially maneuverable and suited for operation in winter as well. Almost all types of these vehicles can be equipped with snow plows and gravel strewing devices. There are roughly three types of dust sweeping machines: those which remove the dust pneumatically, mechanically by a brush band, and mechanically with rollers. All vehicles have water tanks to bind the dust. Today's street washing trucks have changed too. Since their work is confined to the short hours of low traffic they need large water containers to avoid wasting time through refilling. The slot-shaped nozzles, rigidly of movably arranged, have been found to be most satisfying. The usefulness of melting machines for the snow removal is presently being tested. Although they are very effective, their huge dimensions will certainly impair the smooth flow of traffic in busy streets. (Text-German).

66-0585
Periconi, J. F. Summary of 'technological developments in street sanitation.' In APWA Yearbook 1966. Chicago, American Public Works Association. p.168-173.

Street dirt is one of the sources of dust and dirt in the air in New York City. Various parking restrictions have been developed to free the gutters of parked cars to allow access for street cleaning. For a test, two turnbuckles were placed in a broom suspension, one on each side of the pick-up broom. This arrangement permitted close control of the broom pattern and prevented lopsided wear of the pick-up brush. By close control of the pattern, the average life of a pick-up brush was increased from 118 to 245 miles. This means a potential savings of $467 per sweeping machine per year. Limited tests were conducted on brushes of different designs. Replacing forgings for cast steel runners which were brittle and tended to fracture increased their life from 860 to 1950 miles. The research uncovered potential savings of $300,000 annually. Sweeping machines are available with three or four wheels. A one-day training course in operation and adjustment of the sweeper was made obligatory for all operators and supervisors. The APWA film, 'Adjusting the Street Sweeping Machine' is recommended.

66-0586
Quick work on the freeways, Public Cleansing, 56(4):182, 1966.

A new air jet vacuum machine, capable of speeds up to 30 mph while cleaning, is now being used by the California Division of Highways. It has a 7-ft cleaning spread and and only one pass at each shoulder is required. The truck is radio-equipped and when the vacuum is not operating, the truck can travel at 50 mph. The vacuum is operated by the driver and the truck is trailed by a protective vehicle to warn traffic. One hundred nylon filter sleeves remove particles and place them in the four cu yd hopper. Mounted atop a heavy-duty truck frame, the air jet vacuum operates on an eight-cylinder industrial-type auxiliary engine.

66-0587
Rheinfrank, J. Half a million dollars saved. American City, 81(7):28, 1966.

Using Vac-All vacuum loaders to collect debris piled on the street by mechanical street sweepers has saved Milwaukee, Wisconsin, about half a million dollars since 1959. Two units were obtained in 1959 and a third was purchased in 1964. Front-end loaders, supplemented by laborers with shovels, used to pick up the sweepings at an average cost of $7.17 per cu yd loaded and hauled. The vacuum method reduced this price by $5. Since the units have picked up some 104,000 yd of sweepings (in addition to leaves in the fall), saving over the six-year period totals approximately $500,000, which is about five times the combined purchase price of the three units. The units combine loading and hauling, making front-end loaders and dump trucks with hand labor obsolete. A full crew consists of driver and a helper who manipulates the suction intake. All units are performing well with an average downtime of less than 1 percent.

66-0588
Rubbish collecting sweeping machine. VDI (Verein Deutscher Ingenieure) Zeitschrift, 108(32):1604, 1966.

A rubbish collecting sweeping machine is reported which can be attached to existing single axle engines, or small tractors, and which works optionally with a filter or spraying device. The rotating broom and other parts are easily exchangeable. The rubbish container can be emptied quickly. The machine is suited for sweeping sidewalks, footwalks in parks, and smaller squares. (Text-German)

HEALTH AND SAFETY

66-0589
Anderson, J. R. Biological interrelationships between feces and flies. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.20-22.

In the United States about half of the two billion tons of manure produced per year by cattle is left on pastures. Pasture flies which convert feces to biomass are therefore beneficial. In contrast to the pasture ecosystem, newly developed feeder lots with high concentration of cattle exclude the horn fly, face fly, and other unobtrusive pasture flies from this unnatural habitat and manure accumulates rapidly. The feeder lot therefore supports immense quantities of houseflies and stableflies affecting animals and man. To alleviate this problem, removal of manure, rapid treatment and disposal of manure are recommended. Recent studies in California showed that when poultry waste was removed and distrubed, egg laden flies were attracted. Livestock operation with removal of manure can be thus used as fly traps. Fly larvae could also be used potentially as animal feed. Some African beetles can be used for disposing of manure. The use of beetles is one facet of animal waste removal that has not yet been seriously considered in the United States.

66-0590

Coffey, D. Studies on the association of flies (Diptera) with dung in Southeastern Washington. Annals of the Entomological Society of America, 59(1):207-218, 1966.

Since World War II interest has increased in excrement-frequenting flies as potential transmitters of human disease. This paper deals with the species of flies which frequent and/or breed in the various types of excrement found in a rather localized region: Whitman County, Washington, and certain adjacent areas. Excrement from humans, cattle, horses, swine, dogs, chickens, sheep, mink, turkeys, and hamsters were collected by various methods. Some dung was brought to the laboratory for rearing the larvae, but most specimens were collected in the field. Random collections were made at seasonal intervals for a period of two years. About 15,000 specimens, of which 7,000 were pinned, were collected. It was found that no species was restricted to a particular type of excrement, but several were rare on all but one type. One hundred thirty-nine specimens of Diptera were recorded, of which 48 were considered to be members of the dung community. Cow dung attracted the largest number and widest variety of species. Information is also given for each species concerning its dung preferences, seasonal distribution, geographic and climatic distribution, and other observations on bionomics.

66-0591

Decker, W. M., and J. H. Steele. Health aspects and vector control associated with animal wastes. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.18-20.

Many diseases of animals can be transmitted to men through animal wastes. The following diseases transmitted through animal wastes are characterized and discussed: anthrax, salmonellosis, tuberculosis, brucellosis, and leptospirosis. The continuing spread of urban populations with reduced availability of open areas for animal waste disposal will require new methods which should prevent the multiplication of insect and rodent vectors of disease, eliminate means of direct transmission of diseases to men, and prevent leaching of draining of materials containing pathogens to ground water sources.

66-0592

Disposal factors and treatment facilities. In Accident control in environmental health programs. New York, American Public Health Association, Inc., 1966. p.45-49.

Objects discarded by adults are often attractive to a child, despite their potential danger. Sharp glass or metal and containers of toxic substances can cause many accidents. Rubbish accumulation and unsanitary conditions in family refuse-disposal areas also result in many injuries. Educational programs should encourage the safe and immediate disposal of hazardous materials. Not only children are victims of accidents emanating from refuse areas. Discarded drugs and chemicals and highly toxic or flammable wastes present a danger to adults. Refuse-collection workers are exposed to many hazards such as heavy lifting, handling of discarded irritants, and working with dangerous crushing machinery. Water and sewage systems present specific potential hazards as a consequence of gases, liquids, and solid chemicals which result from bacterial processes or which are used the control of bacteria. Safety features of municipal plants should include precautionary measures against fire, slipping and falling, and electrical shocks. Hazardous gases and vapors, irritants, and chemicals should be detected and their potential dangers overcome. Owners of private water systems must take measures against personal and public accidents such as falling, entrapment, drowning, fire, asphyxiation, or electric shock.

66-0593
Eastern Centre members visit Belgium. Public Health Inspector, 75(3):186-187, 1966.

A party of 30 public health inspectors, all members of the Eastern Centre of the Association, visited a Brussels suburb to study refuse collection and disposal methods. Controlled tipping and pulverization costs were lower than incineration costs. Refuse is collected three times a week and a special collection for bulky items is every two months. Vehicles make a journey of 20 miles to the nearest tip. The members were told that one of the biggest problems facing scientists was pesticide residues in food.

66-0594
Fire prevention regulations for the use of paper waste bags. Staedtehygiene, 17(2):43, 1966.

Fire prevention regulations have been worked out jointly by the hospitals and the fire departments. They agreed that paper waste bags must carry a sign: 'Do not throw glowing waste into the bag'. No paper waste bags are to be placed in hallways or near flammable material. Eventually, the waste bag holders must be replaced by fireproof metal wall-type holders. (Text-German)

66-0595
National Commission on Community Health Services. Health is a community affair. 1966. 309 p.

A synthesis of six task force explorations and a report on community action studies drawn from 21 communities extending across this country from Springfield, Massachusetts to San Mateo, California and ranging in population from 30,000 to 3.5 million are reported. Papers from the White House Conference of 1965, other health studies (community and national), and the health legislation that has been enacted into law during the life of the Commission are considered. It is recommended by the Commission that four basic steps be taken now to deal with the fast growing problem of solid waste disposal: waste disposal and conversion should be planned and operated on a problem-shed basis; health agencies should establish adequate community standards for collection and disposal of solid wastes, and, in cooperation with the responsible operating agencies, exercise leadership in evaluating the adequacy of these activities; state governments should adopt enabling legislation tools to perform this function effectively; and industry, foundations, and government should give high priority to research into methods of solid waste disposal and conversion. Industry should be required to reduce its pollution of both air and water. Solid wastes are considered under the topics of comprehensive environmental health services and environmental health personnel. (A prepublication edition prepared for use by the 1966 National Health Forum, May 9-11, 1966)

LITTER

66-0596
Cellini, W. F., 'Pop Art' brightens litter containers. American City, 81(8):16, 1966.

Litter containers in Springfield, Illinois, are painted with bright colors and 'pop art' designs.

66-0597
Fine art of can decoration blooms across the country. Refuse Removal Journal, 9(12):40, 1966.

In Dallas, Chicago, and Taos, New Mexico, amateurs and professionals have brightened their community's refuse receptacles by painting them. In Taos, the vogue quickly spread to own an original trash can work of art.

66-0598
Focus on litter. Public Cleansing, 56(6):265-267, 1966.

There is a growing awareness of the national and local press for the need to stimulate public opinion and to make the public realize its responsibility for disposal of articles that are no longer useful. A television program showed a section of highway in the countryside littered with a cash register, a refrigerator, a water tank, a bicycle frame, a perambulator, clothing and other scattered domestic debris. Amenity societies such as the Keep Britain Tidy group and the Council for the Preservation of Rural England complained that the Litter Act of 1958 was not being enforced with sufficient severity. A new poster will be issued in tens of thousands for public display to help bring about an improved public conscience.

66-0599
Lick litter. American City, 81(1):20, 1966.

Cities must both instill residents with the desire to have clean streets and provide adequate collection and convenient disposal sites. They should install acessible litter containers, promote use of auto litter bags, and use clean-up cost figures to show the wastefulness of littering.

MANAGEMENT OF SOLID WASTE SYSTEMS

66-0600
Public relations. Public Cleansing, 56(12):618-620, 1966.

A summary of discussions and more or less formal talks on the public image of waste disposal is presented. The first concern was to have a reputation of being a good organization to work for. A sustained effort must be made to establish a mutual understanding between the service and those served. Lack of interest arises from lack of knowledge. An experienced public relations officer could sell the idea of cleaner refuse storage, cleaner collection, nicer vehicles, and cleaner disposal. The local press is an important means of reaching people. It is important to help the public understand why a particular situation has arisen, what was required and future plans. Another paper dealt with the depressing results of an anti-littering campaign. The public of this country (Great Britain) is insensitive to appearance and tolerant of squalor. The Litter Act of 1958 had failed completely. The habit of littering was not only the result of thoughtlessness, but also the result of a deeply ingrained national characteristic. Since the U.S. also has an oversized litter problem, it was interesting to speculate why the litter problem seemed to be confined to English-speaking countries. TV and radio were means of informing the public. Films (and one called 'Let's talk rubbish' was said to be excellent) are often effective in their combination of visual and oral persuasion. Exhibits might also prove useful.

66-0601
American Public Works Association. Refuse disposal management. In Municipal refuse disposal. 2d ed. Chicago, Public Administration Service, 1966. p.332-372.

The pertinent elements of refuse disposal management include organization, personnel, reporting, cost accounting and budgeting, public relations and some special administrative considerations. Several organization charts are presented and experience obtained is evaluated in terms of coordination, supervision, and accountability. Basic standards for good personnel administration are outlined and the employee-management relations are discussed with particular attention given to the suggestion system. Other items covered are training, organization of employees, accident prevention, program activity, safety manuals, wages, and hours. Annual salaries for employees at municipal incineration plants in 12 cities are tabulated and performance measurement and records are discussed. Elements of cost that can be standardized in the framework of a reporting system are suggested, e.g, amortized cost per ton of a plant that costs $5,000 per ton to construct would be $1.50 per ton of refuse processed. Tables are presented of principal operating and cost data for 10 incineration plants, of departmental costs of incineration and landfill operations in New York City and per capita costs of sanitary landfill operations in about 200 U.S. towns. Several plant operating report forms are shown illustrating the possible approaches toward the analysis of performance and costs. Of interest is the survey of charges of private refuse haulers, business and industries for the use of municipal refuse disposal facilities. The average is $3 per ton.

66-0602
Applying technology to unmet needs. U.S. Department of Health, Education, and Welfare, Feb. 1966. 12 p.

The apathetic public and public administrations must be made aware of the solid wastes dilemma. Research is needed for refining the following methods so that they can aid in solving the problem: incineration, sanitary landfilling, grinding refuse to sewers, salvaging, systems analysis, and collection. Persons who would lose money if new methods are developed present obstacles to improvements. Recommendations are given.

66-0603

Asks what public is willing to pay for cleaner surroundings. Refuse Removal Journal, 9(1):32, 1966.

Aerojet-General Corp., who received a $100,000 contract from the state of California to create a waste management system, has recommended one coordinated system responsible for collecting and disposing of solid, liquid, gaseous, and radiological wastes. Although Aerojet-General recommended a 10-year, statewide program which would encompass 3 years of comprehensive planning, Frank M. Stead, chief of the California Health Department's Environmental Sanitation Division, suggested that a pilot system program be implemented in a region such as the San Francisco Bay area, which would be large enough for a full-scale test. Mr. Stead stressed that solid waste disposal cannot be accomplished without much expense or at a profit, but that it must be shown that a systems approach to disposal does not cost beyond reason. To do this, a dollar value must be placed on the value of clean, odorless air and pleasant surroundings. Preservation of other values should be taken into account in justifying the systems approach. These would include saving organic material and salvaging non-renewable metals.

66-0604

Black, R. J. Government facets of the solid-wastes problem that must be integrated into a management-science approach. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.151-160.

Much of the present analysis of the place of government among the elements to be integrated in a management-science approach to the solid-wastes problem is concerned with identifying of individual and shared responsibilities. One responsibility facing all levels of government is to find an effective means of fighting public apathy. The central purpose of the Waste Disposal Act is stated and five major areas of support to local and state waste management operations by the national program are outlined. They are: conduct and support for research and training in solid-waste technology; assistance in demonstrating the practicality of improved methods for solid-waste collection, storage, processing, and disposal; support for studies and investigations by community, state, and other agencies other than federal; grants to help pay for surveys and planning to develop adequate waste management systems; and technical assistance to local and state governments. It is shown that solutions to the solid-waste problem, like those of air and water pollution, cannot be compartmentalized within political subdivisions or geographical boundaries. Examples are quoted of ineffective practice of handling waste separately in as many as 129 political subdivisions in one county. Small political jurisdictions almost without exception lack sufficient resources for the required job. Legislation authorizing the creation of solid-waste districts has not been adopted in more than nine states.

66-0605

Bowerman, F. R. Discussion—the problem in perspective. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.23-24.

The preceding paper is paraphrased and interpreted in the light of the speaker's personal experience gathered in France and Spain. Several aspects of solid wastes management should be seen against the background of the existing urban-industrial-agricultural complexes. The old concepts of being able to haul things out of the city into the country no longer hold, as the areas behind the city limits form a highly-developed and highly integrated part of the city's activities. This state of affairs led to a phenomenal intensity of agricultural land use, creating fly-breeding potential and odors that the urban communities cannot cope with. Some material to be disposed of proves to have only negative value on the current market (the present value of dairy manure in Los Angeles County is minus $2 per ton). Further examples are the negative value of waste paper or car bodies. Comments on other aspects of solid waste management show the necessity of changing the national concept of waste and of developing a national conscience regarding the manner in which things are created and destroyed without making greater use of them.

66-0606

Bowerman, F. R. Los Angeles County activities in refuse disposal. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.169-173.

In Los Angeles County the operating sanitation districts include 70 of the county's 75 incorporated cities and large tracks of unincorporated area. Each city is represented on every board of directors of each district that includes that city. The powers, which the district has through its directors, are listed and the mode of cooperation is indicated. Since 1955 the districts have opened five landfill sites to the public and one transfer station. The cost of acquisition and implementation of these facilities was greater than the funds accumulated through the districts' special tax levy. The districts do not collect refuse, but maintain the disposal sites and transfer station open to the general public and the municipal refuse collection agencies. The described system now handles approximately one-half of the total refuse generated in the Los Angeles Metropolitan area.

66-0607

Brown, A. A. Understanding this new approach. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.55-62.

The role of the systems analyst is defined and various systems of analysis are described: the open-end and closed-loop systems, both simple and elaborated, with and without interaction. Three publications are suggested for reading about the aims and methods of systems analysis and model design. (1) Ira Lowry, A Short Course in Model Design, Journal of the American Institute of Planners, May 1965 (2) the Aerojet-General report (3) Charles Hitch, Decision Making for Defense. The last-mentioned book is analyzed, and the notion of a program is specified.

66-0608

California finances regional planning. Refuse Removal Journal, 9(12):34, 1966.

A $175,000 two-year contract has been awarded by the State of California to Aerojet-General Corporation Von Karman Center's Life Systems Division in order to investigate, plan, and design a regional solid waste management system for Fresno County. Fresno was selected since it is an ideal model for other California urban-agricultural areas as well as similar regions throughout the nation. The first subcontractor appointed to the project was Engineering-Science of Arcadia, California. Aerojet-General Corporation's Von Karman Center was recently awarded a seven-month $60,000 study contract by the Public Health Service for compilation of information on types, sources, and processes of solid wastes.

66-0609

California study looks into the future. Refuse Removal Journal, 9(4):20, 40-41, 1966.

A discussion of the report by Aerojet-General, which had been asked by the State of California to apply its systems development abilities to the growing pollution problem, and draw up preliminary guidelines for waste collection and disposal systems that would halt the pollution of water, land, and air, is presented. The report recommends refuse trucks that grind waste and flush it into the sewer system, an underground conveyor network that transports refuse from individual households to collection points, and rapid transit vehicles that speed solid waste to distant disposal sites. Based on scientific planning methods, the study attempts to present guidelines for handling all kinds of waste in the future—solid, liquid, gaseous, and radioactive. Unfortunately, the report does not consider solid waste material generated by commercial and industrial establishments, and has not thought through the practicality of some of its recommendations for materials handling. It also completely ignores the role of the private contractor in refuse collection and disposal.

66-0610
Cheek, F. R. One community's success. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.161-168.

The aims and methods adopted in the Detroit region to improve refuse disposal are reported. The study was based on questionnaires and staff interviews with local public officials and private sanitation contractors. It was learned that of the 178 municipalities, 82 disposed of part or all of their collected refuse in areas outside their own boundaries, 88 of the communities favored a consolidated program of some kind. The conclusion was reached that only two basic, tested methods were feasible: (1) incineration in large-scale publicly-owned-and-operated incinerators, with disposal of residue in sanitary landfills; and (2) sanitary landfilling of the raw refuse. Two plans were developed in which districts were designated around 45 sanitary landfills, utilizing the presently operated four large City of Detroit incinerators. It was estimated that in Plan I, about 1,830,000 tons per year would be disposed of at the major landfill site in the year 1980. This would include incinerator refuse and raw refuse. In Plan II, incorporating 7 new incinerators, 464,000 tons would be buried at the same site in the same year, 1980. The report based on the study appeared in 1964. The paper reviews the order of organizational steps taken by responsible bodies to meet the stated requirements, and suggests improvements of the planning procedure revealed by the adopted approach.

66-0611
Curtiss Everts named regional wastes director. Western City, 42(10):51, 1966.

Curtiss M. Everts, director of the Pacific Northwest Water Laboratory, has been assigned to the post of Regional Solid Waste Program Director in the service's San Francisco Regional Office. He will be the Public Health Service's principal representative in Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington and Guam. The Office of Solid Wastes is coordinating a program to eliminate health hazards resulting from improper waste handling. Mr. Everts, who holds a masters degree in sanitary engineering, has been engaged in public health engineering for 35 years.

66-0612
Divided responsibility hurts city's cleanup. Refuse Removal Journal, 9(4):26, 1966.

In an editorial in the Milwaukee Journal, the problems surrounding refuse collection and disposal in and around Milwaukee are discussed. Everybody blames someone else, yet all must work together to solve the problem. The city housekeeping is complicated by the fact that responsibility is divided among at least four city agencies. The Health Department polices public housing projects; the Garbage Collection and Disposal Bureau picks up waste that burns; the Street Sanitation Bureau collects waste that does not burn; and the Housing Authority oversees public housing projects. Cooperation and communication are almost completely lacking. Other areas which need attention are: the city's low rent housing districts; the combined collection of burnable and nonburnable waste; and the use of large new incinerators for the combined disposal. The city of Milwaukee cannot wait for such incinerators, and is prepared to build its own if the county does not.

66-0613
Eldredge, R. W. Long-range community planning. In Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.41-43.

The objectives of a community plan are summarized, hints on data collection, analysis, and evaluation are given, and the specific items on which forecasts are required in order to provide solid waste prospects with some degree of reliability are stated. Further factors are listed which should be rechecked and the establishment of community limits is indicated. Stress is laid on the elasticity of a solid waste plan continually reviewed and refined, but basically directed toward an improved program of solid waste handling.

66-0614

Gilbertson, W. E. Managing solid wastes for a better environment. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.95-102.

Factors are indicated that have affected a change in the public attitude toward the problem, thus creating a sound basis for tackling it. The public consciousness of the environmental pollution has led to the translation of this public concern into public action. Effective coordination is requested, especially in view of the Federal Solid Waste Disposal Act of 1965. Several suggestions are presented for improving solid-wastes disposal: challenging the competency of industrial and other private enterprise personnel, utilization of federal, state, and local public facilities as centers of innovation, and making regional intergovernmental cooperation attractive.

66-0615

Gilbertson, W. E. Solid waste disposal. Presented at Engineers Joint Council Annual Meeting and Seminar on National Affairs, Washington, Jan. 17, 1966. 17 p.

National issues relating to the solid waste problem include the need to overcome the past neglect of solid waste. In creating new solid waste technology, the concept of re-use, conversion, and utilization is a matter of priority consideration. Waste management systems—the integration of all forms of waste (gaseous, liquid, and solid)—should be conceptualized, and operationally demonstrated. The engineering profession has the opportunity and responsibility to exercise a major role in the formulation of national policies relating to environmental concerns—such as solid wastes—through advisory committees, support and promotion of legislation, and public hearings. To carry out new activities, the Solid Waste Disposal Act authoriizes the appropriation of more than $92 million over the 4 fiscal years of 1966-1969. The cooperation of Federal, State, regional, and local governments, coupled with the responsible of those portions of the private sector, should make it possible to inaugurate and accelerate a national program for solid waste management.

66-0616

Group leads haulers in union negotiations. Refuse Removal Journal, 9(8):18, 1966.

The history and activities of the Chicago and Suburban Refuse Disposal Association are described. Formed in 1933 of private refuse contractors, the Association now has six local units, one each for the half-dozen geographical sections of Chicago and its suburbs. A delegate from each local is a member of the board of directors and attends monthly meetings of the board. The Association's career is marked by a record of accomplishment. Although the City of Chicago still used horse-drawn trailers in the thirties, refuse contractors had begun using faster and more modern gasoline-powered open trucks. Private haulers also preceded the municipalities in the use of the modern refuse compaction vehicles. The Association works with the City of Chicago in its annual Clean-Up Campaign and even donated 150,000 litter bags to the Clean-Up Campaign in 1965. It has negotiated a contract with the union serving the industry and has set up group insurance and hospitalization programs for its member organizations. The Association has also sponsored a research campaign and checked incinerator operations throughout the country in order to obtain information for the building of the first contractor-owned incinerator in the country. This incinerator is in use every day of the week in the South Side of Chicago.

66-0617

Hart, S. A. Coordinating management science with other solid-wastes research. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.185-191.

The paper raises the question of where the professionals, active in various fields of wastes disposal, fit in with the newly-developed technique of management science. Both the possibilities and limitations of the systems-analysis branch of management science are taken into consideration when indicating the performance of the individual professional activities. Reasons for combining technological research and management science studies are stated and possible coordination is outlined using the example of the University of California study aimed at an improved solid-wastes disposal program for the San Francisco Bay Area.

66-0618
Institute's evidence to Royal Commission. Public Cleansing, 56(12):591-595, 1966.

The Institute of Public Cleansing has submitted its views on the place of public cleansing services in the organization of local government and the minimum requirements for efficient operation to the Royal Commission on local government in England after defining the services involved. The Institute also discussed the costs, which in 1963-64 amounted to £80 million, constituting the fourth largest local government activity; the health effects; the extent of the problem (15 million tons, 2.1 lb per day per person and going up); and the organization. Recommendations were made for the optimum size of authority, its direct responsibility, and the specialization and training of personnel.

66-0619
Jackson, T. P. Application of the approach. The California waste management study. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California p.63-90.

An outline of the Waste Management Study is illustrated stating its purpose in terms of the application of the systems approach. A detailed diagram shows the application of this approach to the waste management field. For the purpose of analysis the system is divided into three elements: (1) input; (2) man-made processes; and (3) environmental processes. Interrelated actions of these three elements are indicated and the construction of a simplified model is suggested, attempting to determine pollutant concentration in a large air mass as a function of location. Examples of predicted air pollutant concentration for the Sacramento area are diagrammatically shown for the years of 1965 and 2010 at one reference weather condition. Further items of the study necessitated the establishment of California Study Regions with economic assessment of each of them. Annual system and social costs are exemplified for one region and fragmented responsibility for waste control is illustrated by a chart. Planning factors are discussed and selection criteria suggested to meet the requirements of the plan selection for the proper region. A list of recommendations is presented, stating the necessity for the appointment of a waste management coordinator, establishment of environmental objectives, and application of the systems approach to a specific problem.

66-0620
Koch, A. S. Regional approach to refuse disposal. In Proceedings; First Annual Meeting of the Institute for Solid Wastes, Chicago, Sept. 13-15, 1966. American Public Works Association. p.31-33.

The Orange County (California) Solid Waste Disposal System is described in detail. Orange County covers approximately 800 sq miles and has a population of nearly 1,200,000. The county contains 24 incorporated cities which represent about 65 percent of the total land area and 89 percent of its population. Prior to 1947, refuse disposal was handled on a local community basis. Then the Orange County Board of Supervisors adopted an ordinance outlawing indiscriminate dumping and established certain sites as County dumps. A study made in 1959 recommended that a system of landfill disposal supplemented by a system of four refuse transfer stantions located in the long haul zone be adopted. An estimate of life expectancy of the existing landfill sites indicates that they will be adequate to meet the needs of the county, without change, until 1980. The next step is to select and designate additional canyons as future landfill sites to insure the future of the waste disposal system.

66-0621
Loehr, R. C. Keys to progress in solid waste management—research and engineering studies. In Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.44-48.

Competent engineering services are needed to delineate the most preferable refuse collection system and disposal methods as well as the cost. The most important items of a comprehensive engineering study as regards the selection of one of the three basic methods of refuse disposal (sanitary landfill, composting, and incineration), are listed, indicating a number of subitems pertaining to each of these methods which require close engineering scrutiny. Attention is also drawn to refuse collection and the necessary interrelationships with disposal techniques, and new approaches are indicated together with solutions of advanced education and management.

66-0622
Logan, J. A. Systems analysis—generalized approach to technology. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.45-53.

The nature of systems analysis is contemplated with emphasis on its aptitude to approach logically the solution of complicated multi-variable problems. As most engineering problems involve political, economic, or human factors, engineers should be educated to realize that these are the kind of problems they will often have to deal with. The paper states the growing importance of the 'Systems Evaluation' and the necessity of reevaluating the present-day concept of engineering education. A consideration of engineering systems (objectives, criteria, and professional responsibility) should precede component design in the educational plan rather than follow it, as is present practice. Instead of talking specifically about the technological solutions involved, environmental control and environmental management should be stressed, thus creating an attractive challenge for the high-school student reluctant to work in the solid-waste field.

66-0623
McDonald, J. L. There has to be a pony someplace. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.91-94.

The introductory remarks of the Master of Cermonies at the Conference evening dinner are incorporated as part of these proceedings. Examples are given of local initiative showing interest and involvement in the solid-wastes problem.

66-0624
McGauhey, P. H. The problem in perspective. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.11-21.

A summarization is given of some of the basic aspects of the solid-wastes management problem, listing the effects of urbanization, public attitudes, variety and nature of wastes, educational deficiencies, and limits of technology and research. The problem calls for a community-wide approach for which existing fragmented jurisdictions are inadequate. For example, in the San Francisco Bay, there are some 83 separate but impinged jurisdictions and agencies seeking to sequester solid wastes in each other's back yard at 77 locations. Moreover, the traditional 2 lb per capita per day has has now reached an estimated 6 to 8 lb in many localities, with industry creating some 2,000 new products each year. Evidence is presented for the rising public awareness of the problem confronting public agencies and jurisdictions at the technical and operational level of management, manifested by a number of developments at the federal level.

66-0625
McKinney, R. E. Solid waste disposal. In Proceedings; First Governor's Conference on Environmental Planning for the State of New Mexico, Albuquerque, N.M., Mar. 16-18, 1966. Albuquerque Department of Environmental Health. p.51-53.

The many facets of the solid waste problem are briefly reviewed. In 1963, the United States was producing approximately 150 million tons per year of refuse, 4.3 lb per capita per year. Local governments spend over $1.5 billion per year for refuse while private collectors require an additional $1.3 billion. The small number of people and the availability of land has prevented the solid waste problem from creating serious difficulties and may help the people of New Mexico avoid some of the problems facing more urbanized areas. Agricultural wastes and mining wastes are equally as important as municipal refuse and should not be ignored. The state must examine the problem where there is no organized unit to study the problem and to develop an overall plan. Since ultimately the land must be the receiver of the solid wastes, land around urban areas must be dedicated for this purpose. State officials are cautioned against depending too much on Federal financial assistance and are encouraged to assume the burden of solving the solid waste problem on a state level.

66-0626
McKinney, R. E. Summary. In Proceedings; Solid Wastes Symposium, Lawrence, Kans. Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.66-70.

Summarizing the fundamental ideas of the papers and of the discussion of the Solid Wastes Symposium, the speaker classified the subject of solid waste disposal into the following four main groups: the recognition of the problem, professionally educated staff to handle it, the money to pay for its solution, and the organization to realize the solution. The problem of solid waste disposal does not appear to be recognized properly, often being broadened or narrowed too much. People have to be educated and the federal funds should not be considered as the only means of financing the local projects. Neither of the existing professional bodies attacks the solid waste problem exclusively. In all respects, therefore, much is still left to the personal initiative of those who have been involved in the solving of the problem.

66-0627
McKinney, R. E., et al. Workshop session—solid wastes disposal. In Proceedings; First Governor's Conference on Environmental Planning for the State of New Mexico, Albuquerque, N.M., Mar. 16-18, 1966. Albuquerque Department of Environmental Health. p.95-97.

The New Mexico Department of Public Health has long been active in the solid waste field. The state has the highest infant mortality rate in the country and much of this is from the enteric diseases in which flies may play an active role. The major problems in solid waste disposal arise from the fact that modern legislation is lacking. Outside of incorporated municipalities nothing can be done, with a few exceptions. The economic makeup of the state also creates problems. Tourism is important and resort areas with permanent populations of a few hundred, enlarged cities of 20,000 during the season, create serious solid waste problems. Lack of land for disposal in national forests surrounding these communities also creates problems. Other difficulties involve agricultural wastes such as waste from cattle feed lots and cage chicken farms, final disposition of used tires, junked automobiles, and radioactive wastes. It was resolved that the New Mexico State Legislature provide for the establishment of a section within the New Mexico State Health Department devoted entirely to solid wastes and that it provide needed enabling legislation to allow all areas of the state to establish operational units for proper solid waste disposal.

66-0628
The many-sided problem of environmental quality. In Resources for the Future. Annual Report for the year ending September 30, 1966. Washington, Resources for the Future, Inc., 1966. p.13-18.

The increase in population, industrial production, automobiles in use, and personal consumption expenditures yield greater amounts of wastes which in turn cause increasing pressures on the natural environment. Pollution makes many of the already scarce resources unfit for consumption. If the population continues to increase at the present rate, pressures upon both environmental quality and supplies of natural resource products soon will become intolerable. Progress causes smoggy atmosphere, polluted streams, and automobile graveyards. Dumping wastes into rivers is a cheap disposal method for the town or factory which does it, but it costs the persons downstream to either purify the water or suffer unpleasant sights and smells.

66-0629
Maryland State Department of Health, Division of Solid Wastes. The applicability of a systems approach to solid waste management problems.

Washington, Management Technology, Inc., July 1966.

This study, conducted for the Maryland State Department of Health to be presented to the General Assembly of Maryland, is a definitive description of the application of systems techniques to the costs aspects of solid waste programs. Although the report was based upon a generalized hypothetical situation, the basic concepts can be applied to specific solid waste programs in different areas of the state, as well as to solid waste programs in other parts of the country. Analyses were made to determine the applicability of a systems approach to solid waste management problems. The techniques utilized were: systems analysis, systems simulation and synthesis, and comparison of results. The content of the report consists of: Introduction, Solid Waste System Organization, Cost Simulations of Sample Design Systems, Correlation and Comparison of Simulated Systems Costs, and Observations and Conclusions.

66-0630

Michaels picked to head new Institute for Solid Wastes. Refuse Removal Journal, 9(2):50, 1966.

An Institute for Solid Waste has been formed within the framework of the American Public Works Association. Abraham Michaels was named president, pro temps, of the new organization until membership is completed and elections held. An Institute for Municipal Engineering was also formed. The primary purpose of the Solid Waste Institute is to promote safe, sanitary, and efficient refuse handling procedures in urban communities, whether by a private contractor or municipal department. A member of the Institute must be a member of A.P.W.A., and have an administrative or supervisory role in street cleaning, refuse collection, or disposal. An associate member must also be an A.P.W.A. member and have special knowledge, experience, or interest in the broad field of solid waste collection or disposal. Membership fee is $5 per year. The annual meeting of the Institute members will be held in conjunction with the A.P.W.A. Congress and Equipment Show, though special meetings may also be held. A permanent Committee on Solid Waste Handling, chaired by Floyd Bowers, has been formed by the Washington Chapter of A.P.W.A., as a result of the high interest of its members in refuse collection and disposal problems. The objectives of the new committee lie in three fields: education and training; research and development; and legal measures.

66-0631

More states join national solid wastes campaign. Public Cleansing, 56(11):568-569, 1966.

Seven more states have received nearly $190,000 in matching funds from the U.S. Dept. of Health, Education, and Welfare for surveys and plans on a state-wide basis to end solid waste disposal practices hazardous to health and aesthetics. There are now 21 states participating in these planning phases. The primary objective is to encourage state-wide planning coordinated with air and water pollution control. Another objective is to get plans made on an area basis rather than on small political units, since political jurisdictions are often too small to be able to afford anditary and efficient systems. The states receiving these grants were: Georgia, Louisiana, North Carolina, Ohio, Oregon, Virginia, and Washington.

66-0632

Nejedly, J. A. Legal facets of the solid-waste problem that must be integrated into a management-science approach. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.103-107.

The paper raises some of the problems incident to political organization and discusses means by which such organizations can be developed. The need for the extension of interstate or intergovernmental units and for state authorities as exemplified in North Dakota is expressed. Another problem to be solved is the development of relationships between political agencies within one state. In Utah and Rhode Island, intergovernmental relationships are prohibited as a matter of constitutional limitations. Other states, like Kentucky, Montana, and Virginia, do not have a prohibition but provide no authority. In many states (examples are Idaho, Ohio, Michigan, Oregon, Washington, and, in particular, California) the legislature has already specifically authorized intergovernmental relationships in this area of solid-waste management. Intergovernmental relationships may be established by three methods: joint exercise of powers agreements, development of special districts (such as the Bay Area Pollution Control) and the statutory development of a new governmental agency within an existing governmental agency.

66-0633
New developments in anti-pollution. Compost Science, 7(1):16, 1966.

The National Academy of Sciences, through its Committee on Pollution, has suggested the establishment of a National Center for Environmental Protection, pointing out that by 1980 sewage and other organic wastes will exist in all 22 of the nations's major rivers so that they will contain no oxygen during their dry-season flow. Economic pressure for control may take the form of the right to include waste treatment costs when pricing products and deducting equipment costs from taxes. A special tax for companies discharging wastes has also been suggested. A federal bill would expand 10-fold the present $150 million a year aid to help build municipal sewage treatment works. More than 1,300 of the 11,000 communities with sewer systems still dump raw sewage into waterways.

66-0634
New Jersey town wants land survey. Refuse Removal Journal, 9(2):41, 1966.

The Montclair, New Jersey, town commission passed a resolution asking the governor, the state health commissioner, and the legislature for a three-part program to meet the need for systematic and comprehensive plans for solid waste disposal in northern New Jersey. The measure asks that a survey be undertaken to study and investigate available land disposition sites and the terms and conditions under which they are presently being used. The resolution also requested that the state formulate an effective and equitable plan for use of land disposition sites so that solid waste disposal may be handled economically by municipalities; and that state aid be given to explore means and locations for incinerator sites.

66-0635
New techniques may solve solid waste disposal problems. Public Cleansing, 56(7):355-356, 1966.

Brief summaries are given of a few of the papers presented at the First National Conference on Solid Wastes, April 4 and 5, Davis, California. The Chief of the Office of Solid Wastes, Wesley E. Gilbertson, spoke of research and training, demonstrations of new technology, and planning. Four areas are important: The fragmentation of solid waste operations among small political units must be ended. Waste management must be consolidated into programs for air and water pollution control. The present emphasis on the nature of solid wastes must shift to consideration of the environmental consequences of their disposal. Wastes must be reduced at their source (in manufacturing, for example, through the development of packaging which safely disintegrates in the environment). 'The best kind of pollution control is not to produce the waste.'

66-0636
Nilsen, J. Solid wastes challenge the disposal experts. Chemical Engineering, 73:60, 62, 64, 1966.

The environmental engineer is not only concerned with the problem of disposing of 800 million lb per year of solid wastes produced in the United States, but with the interaction of air, water, and land pollution. The annual cost of refuse collection and disposal is $1.5 billion and the solid waste problem is considered more difficult than that of air and water pollution. In this survey article, the total systems attitude toward wastes is stressed with the emphasis placed on an analysis of the total environment with consideration given to the assimilative capacity of water, air, and land taken collectively, and as single entities in relation to plant and animal life. The lines of research which should recieve the most attention are: reduction of the quantity of waste at the source, recycling and reclaiming of waste materials, and improvement of disposal methods. Emphasis in this review is on future action to solve the developing and so far neglected problem. The impact of the Solid Waste Disposal Act of 1965 which authorizes the expenditure of $92 million in four years in research, development, demonstration projects, surveys, and technical and financial aid to state, regional, and local agencies, cannot be underestimated. The problems, and their solutions, and the implementation of these solutions to the solid waste problem are discussed.

66-0637
Nix, H. L. Community social analysis of Macon-Bibb County, Georgia. Series 2. Atlanta, Georgia Department of Public Health, Jan. 1966. 49 p.

An analysis of Macon and Bibb County is presented to describe, in part, the social structure of the community and its implications for environmental health conditions. By social structure is meant the pattern of human relationships or the typical way members of the community think, feel, act, and relate to each other in their various community groups. More specifically, the report deals with: basic attitudes and values in the community; community efforts; community needs and problems; ratings of community services; areas of cooperation and opposition; community organizations; and community leadership patterns. Twenty-eight leaders were interviewed using a standard interview schedule. Of those, twenty-six completed an additional questionnaire. In addition, several other citizens were interviewed on special topics.

66-0638
Oakes, D. Regional refuse disposal. Study of solid waste refuse disposal in the Southeast Michigan six-county region. Detroit, Metropolitan Fund, Inc., Aug. 1966. 13 p.

Three alternative plans are offered to implement the engineering and fiscal proposals made in the refuse disposal study conducted by the Detroit Metropolitan Area Regional Planning Commission (RPC) in 1964. One local government or an authority composed of several local governments could assume the responsibility for the refuse disposal problem on a contractural basis; one county agency in each county could be assigned the task for its county and also be authorized to contract with other adjoining counties; or a regional authority could be established. The use of sanitary landfills and cooperation with industries in the area were suggested. County valuations and an estimate of refuse produced by counties are tabulated.

66-0639
Offices of solid wastes established in P.H.S. Modern Sanitation and Building Maintenance, 18(3):34, 1966.

The Solid Waste Disposal Act passed by Congress allows for the formation of an Office of Solid Wastes in the Public Health Service. Wesley E. Gilbertson, formerly chief of P.H.S.'s Division of Environmental Engineering and Food Protection, has been appointed Chief of the Office of Solid Wastes. Section 206 of the Act authorizes grants to State and interstate agencies of up to 50 percent of the cost of surveying solid waste disposal problems and developing plans.

66-0640
Prepare for regional planning. Refuse Removal Journal, 9(12):22, 1966.

The regional approach to efficient solid waste handling is gaining ground. So far, however, most regional schemes are still on paper, but where a carefully planned system has become operational, as in Orange County, California, it has lifted a tremendous burden from small and rapidly developing communities. Regional plans also provide a stable and long-term disposal channel for private contractors and help keep future disposal problems under control. Unfortunately, only ten states have set up legislation to permit inter-municipal cooperation, and only a few have state-wide refuse disposal regulation.

66-0641
Proceedings; First Governor's Conference on Environmental Planning for the State of New Mexico, Albuquerque, N.M., Mar. 16-18, 1966. Albuquerque Department of Environmental Health. 143 p.

The objectives of the conference were to bring together representatives of society, industry, and government, to discuss environmental problems, and to recommend to state officals programs to be considered for environmental planning. Among the topics discussed were: housing and urbanization, solid wastes disposal, community health services, recreation and natural beauty, and water resources. Recommendations of the various panels included: adoption of uniform codes and standards, enabling legislation to allow all areas of the state to establish operation units, the undertaking of active compaigns to prevent littering, upgrading of salaries of public health employees, and the establishment of a section within the New Mexico State Health Department devoted entirely to solid wastes.

66-0642
Reports from the Federal Department of Health, Germany. Wasser und Abwasser, 107(4):103, 1966.

A contract was signed by the Federal Government of Germany and by the various state governments to erect a central bureau for waste elimination. As part of the Federal Department of Health, the new bureau has the task of advising all states in questions of waste elimination. The bureau will set up rules and regulations, will publish leaflets, coordinate research and development in this field and will collect statistics. The costs for the new bureau, which amount to 300,000 DM annually, will be shared by the federal government and the state governments. (Text-German)

66-0643
Reports on nation's waste problems. Compost Science, 7(1), 1966.

In a report to the state of California, Aerojet-General Corp. told how California spends $300 million annually to dispose of wastes, including 12 billion tons of municipal refuse. The report suggests using aerospace 'system analysis' techniques to solve the total waste problem. According to Malcolm Hope of the Public Health Service, the capacity of the modern city to drown in its own sewage is more than matched by its talent for smothering itself under a blanket of garbage and refuse. In Houston, citizens breathe air at the bottom of an 8,000 ft dump.

66-0644
Rogers, P. A. The development of a comprehensive solid waste management plan for California--a preliminary report. California Vector News, 18(12):83-90, 1966.

California's population has increased from 1.5 to 19 million since the beginning of the century. Each political jurisdiction, and there are many of them, has traditionally dealt with solid wastes by taking them beyond the confines of the jurisdiction and discarding them in the least expensive manner tolerated by the public. A comprehensive analysis of the size of the problem in the state has been made and the inadequacy of present methods of dealing with it is proven by air, water, and land pollution, aesthetic blight, and the public health hazards of fly and rodent production. A three-year study proposal is presented. It is designed to develop a comprehensive plan for the economic and effective management of solid wastes. Two figures present the plan in graphic form. The roles of the various levels of government and of private industry are stressed.

66-0645
Rogus, C. A. Computers in solid wastes. In Proceedings? First Annual Meeting of the Institute for Solid Wastes, Chicago, Sept. 13-15, 1966. American Public Works Association. p.7-12.

The size and scope of the New York City Sanitation Department are described and current management systems and controls are covered briefly. Two of the largest manufactures of EDP business equipment were induced to undertake separate but simultaneous feasibility surveys of the department. The survey covered the needs of the entire department with greater emphasis on the four bureaus of Cleaning and Collection, Disposal, Motor Equipment, and Plant Maintenance. The study showed that the application of an electronic data processing system to a typical large city sanitation department is feasible and worthwhile. It was determined that the purchase of a disc-pack type of computer offered the greatest potentials and worth to the agency.

66-0646
Shull, I. F. The status of solid waste disposal in Kansas. In Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.23-25.

Information is presented about the status of solid waste disposal in Kansas, showing that cities and county governments have mostly failed to recognize solid waste collection and disposal as a community responsibility and to develop some procedures for providing needed services. Few in-depth studies were made and no truly long-range plans were developed. The public interest should be utilized to support a properly planned program for improving community solid waste disposal practices and minimum standards should be established indicating the state requirements for such programs.

66-0647
Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. 200 p.

These proceedings cover the second of a series of national conferences, relating specifically to solid wastes. The first conference was held in Chicago in December 1963. The idea of a conference on solid-wastes management was made particularly timely in California in November 1964, when bids were invited from the aerospace industry for investigations into the applicability of systems analysis to state problems. The waste management study was awarded to the Aerojet General Corporation and the contract under which needs should have been appraised for a statewide waste management system for California for the next thirty years, ran from January 1, 1965, to August 1, 1965.

The theme of the conference was born from communications between sanitary engineers and representatives of the aerospace industry. The papers presented cover engineering, legal, political, economic and business, regulatory, health, and sociological facets of the problem of solid wastes. Systems analysis, as a method of coordinating and of evaluating interactions and developing an optimum program, seemed worthy of study. It was intended that engineers, health officials, public administrators, planners, scientists, and researchers explore how systems analysis might be brought to bear upon their own activities in solid-waste management problems.

66-0648
Stead, F. M. The future. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.193-220.

The purpose of the program of the Conference is evaluated in terms of the ideas expressed. The individual papers disclosed the obsoleteness of present concepts of waste management for the future, the unacceptable number of organizations and political governing bodies in charge of waste programs, descriptions of the new approaches, and useful points of view of people from different backgrounds or experience. The concept of consolidation of planning is pursued and the merging of the planning on air, land, and water management is analyzed. Further analysis bears upon the question of standards of environmental quality. It is estimated that the changeovers that need to be made add up to about $1.5 billion a year over what is now being spent, or 25¢ added to $1 per capita per day spent on the average on esthetics, not for utility, in California.

66-0649
Summary of the joint meeting of the executive councils of the International Association of Public Cleansing and the APWA Institute for Solid Wastes. In Proceedings; First Annual Meeting of the Institute for Solid Wastes, Chicago, Sept. 13-15, 1966. American Public Works Association. p.50-57.

The meeting opened with a presentation by Reikichi Kojima, Director of the Tokyo Institute for Municipal Research, Tokyo, Japan. After World War II, it became necessary to devise a plan providing for the building of facilities for incinerating solid waste. Under the latest plan, $270 million is to be expended in the five-year period from April 1967 to March 1972 to raise the solid waste burning capacity to 600,000 tons a day. Employee efficiency is the biggest problem in the administration of waste disposal in Japan. Representatives from England, Scotland, Sweden, The Netherlands, Canada, France, Venezuela, Switzerland, and Brazil reported their experiences with, and approaches to the problems outlined in Mr. Kojima's paper. A representative from WHO stated that the most important problem in developing countries is water supply. Efforts in the area of solid wastes are directed toward collecting data and disseminating information.

66-0650
Swager, W. L. Solid-wastes research using management science. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.175-183.

Attention is drawn to the technical limits on the amount of waste that can be released to a water course, to the air, or to the land, and the influence of environmental-quality criteria and subsequently developed standards is shown. The broad direction of the respective research and development resources should be guided by the level of the desired environmental criteria and standards. Moreover, there is evidence to indicate that unnecessarily high costs are imposed by maintaining inadequate waste disposal standards, which leads to 'external diseconomies'. Attention is also given to the costs and confusion that will be caused by arbitrary edicts. The difficulties in establishing practical standards are rooted mostly in the lack of technical data and in the problems of translating these into practical standards or system-output specifications. Consideration is given to institutions for managing an integrated waste-handling and environmental-control system. Against the background of the foregoing analysis, a detailed outline is presented of an effective research program enabling some first approximations of the costs and benefits that would accrue to a specific regional economy as a function of environmental standards.

66-0651
Tools and technology--something for everybody at '66 Congress and Equipment Show. APWA [American Public Works Association] Reporter, 33(10):8-11, 1966.

The most frequent cause of substandard performance by private industry is the failure of local government to prescribe minimum specifications for performance. The entry of the federal government into the solid wastes field will provide assistance to state and local governments. Incineration can reduce refuse to 30 percent its original weight and 20 percent of its volume. The need for eliminating on-site storage, relieving congested streets, and finding alternatives to limited sanitary landfill capacities requires examination of liquid-borne disposal systems. Prompt establishment of state-wide and regional standards, classifications and water pollution controls for landfills, and available sites for landfills and incinerators were called for. Increasing use of regional cooperation on solid waste disposal was predicted. Also discussed were rapid transit, accident prevention, street beautification and defense department budgeting.

66-0652
Vanderveld, J. Refuse industry facets of the solid-wastes problem that must be integrated into a management-science approach. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.145-150.

Ways and means of reducing the expenditures involved in solid-wastes disposal are surveyed. Three areas of difficulty are examined: the people actually handling the problem, equipment used for refuse collection, and storage of refuse. In respect to personnel, the primary concern is motivation and training, fair-minded supervision, and fair policy of outstanding rewards for an outstanding performance. There is a shortage of eductional programs offered today in solid-waste management, and therefore, university extension courses are recommended for individuals involved in solid-waste management at the supervisory level. Examples are presented of difficulties arising from overlooking adequate provisions and equipment requirements and from improper storing of wastes next to valuable property. Standards are needed to help architects, plant engineers, etc., and minimum operating standards are necessary for both public and private agencies. The constructive example of the State of Illinois is analyzed.

66-0653
Weston, R. F. Engineering facets of the solid-wastes problem that must be integrated into a management science approach. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.111-118.

Since the basic approach and concepts of control that apply to water pollution apply both to air and solid wastes, a model is developed, based on a large multiproduct industrial plant, and the approach of a company or an industry is examined. Sound philosophy, good knowledge of the waste produced, and pollution control at the lowest possible cost are necessary. The major point of environment control is control at the source. It is erroneous to assume that the solid-wastes disposal problem starts after something has been discarded. The solid waste problem should be analyzed critically relative to solids source, quanitity, characteristics, variability, mode of occurrence, interrelationships, and pollution effects, so that the problem at any specific location can be clearly defined.

66-0654

Williams, R. L. Planning facets of the solid-wastes problem that must be integrated into a management-science approach. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.119-128.

It is shown that from a planning standpoint the problem of solid-waste management involves two areas of coordinative action: interprofessional and intergovernmental. Interprofessional teamwork is the key to effective implementation. Through the research stimulus of the Solid Wastes Disposal Act of 1965, three types of technolpgical breakthroughs are visualized: the application of new tools and innovative techniques in disposing of wastes, changes related to the characteristics of solid wastes such as nutrient food packaging, and the change in product storage and distribution techniques. The need is claimed for a comprehensive environmental monitoring system that operates both statewide and in many metropolitan areas. Solid-wastes management would be an important aspect of such a comprehensive monitoring system. The system would serve the greatest public purpose by helping establish environmental standards and regulations that reflect metropolitan and statewide comprehensive development policies.

66-0655

Witherspoon, J. L. Political facets of the solid-wastes problem that must be integrated into a management-science approach. In Solid Wastes Management; Proceedings; National Conference, Davis, Apr. 4-5, 1966. University of California. p.129-134.

An analysis is made of politics and the politician in terms of the politicans themselves, the characteristics of local government, and citizen response to local political issues. Three general types of local politicians are specified: the single-minded office holder, the non-leader, and the performer, the last mentioned type being the right one to carry through a legitimate public program such as tighter controls on solid-wastes disposal. In characterizing local government, consideration is given to its authority, structure, and age. The key to successful local government lies in carefully maintaining good citizen response to public issues. One of the prerequisites is the simplifying of the phraseology used in communicating with average citizens. And another: 'The best disposal site technically may be the poorest politically. Good sense might well dictate settling for the second- or even third-best site.'

66-0656

Wright, C. W. Problems in providing adequate community solid waste services. In Proceedings; Solid Wastes Symposium, Lawrence, Kans., Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.26-34.

The picturesque 4-year story of the Topeka Street Commissioner's and later Mayor's efforts to solve the local solid waste disposal problem is related. Experience has confirmed that many of the problems, especially the landfill one, could have been solved by a public relations program. Thus more public understanding could have been secured. Recognition of the need for a professional public relations firm for the kind of work in question has led the speaker to express his decision to initiate such a service and to offer his professional help.

66-0657

Answers to waste problems sought. Refuse Removal Journal, 9(2):46, 1966.

Constructive recommendations and proposals to expand research on disposal of scrap autos, mining refuse, slag dumps, and other solid mineral wastes were requested by the Secretary of the Interior, Stewart L. Udall. He asked that universities, non-profit organizations, businesses, and individuals submit ideas to the Bureau of Mines. He declared that 'we need realistic, detailed plans for projects that promise early and meaningful progress in reducing environmental pollution, health and safety hazards, and material wastes'. The bulk of expenditures between now and June 1967 are already earmarked for the construction and operation of two demonstration plants employing processes for utilization of automobile body scrap developed by the Bureau of Mines.

EDUCATION AND RESEARCH

66-0658
A.P.W.A. to help train waste disposal personnel. Western City, 42(8):40, 1966.

Under a $65,500 contract with the Public Health Service of Solid Wastes, the American Public Works Association will supplement solid wastes training for graduate engineers now being supported by the Office of Solid Wastes. This program, directed by Robert Burgher, is one phase of a national waste disposal improvement program designed to reduce health hazards and environmental blight.

66-0659
Bugher, R. D. Development of sound solid waste programs—a major challenge to federal, state and local governments. In Proceedings; Solid Wastes Symposium, Lawrence, Kans. Mar. 2, 1966. Kansas City, Mo., U.S. Public Health Service. p.5-14.

The steady rise in individual refuse production and the change in the structure of refuse make it necessary to find a new approach. Significant amounts of waste are now salvaged and re-cycled back to industry, nevertheless the large amount of labor and equipment involved make collection costs range from 3 to 6 times greater than the cost of disposal. A brief characterization of the A.P.W.A. Research and Education Foundations, their aims and practices is given, and the ideas for research and the organization policies to be pursued under the A.P.W.A. program are indicated.

66-0660
Drexel Tech offers solid waste study. Refuse Removal Journal, 9(11):48, 1966.

This fall the Environmental Engineering and Science Program at Drexel Institute of Technology is offering a special curriculum to deal with the relationship of solid waste problems to those of air and water pollution, land resources, and occupational health. Courses include environmental chemistry, statistical analysis, administration, sanitary microbiology, solid waste systems, combustion theory, incinerator design, and ground water hydrology.

66-0661
The first field grants for refuse disposal. American City, 81(12):36, 1966.

The Office of Solid Wastes has announced grants totalling nearly $2,000,000 for 19 projects to demonstrate or investigate new and improved solid waste disposal systems. These are the first grants to help local and state agencies develop, in the field, nationally applicable approaches to solid waste disposal to replace practices causing environmental health hazards and scenic eyesores. These grants have brought into operation the fifth major component of the Solid Waste Program. Other major activities of the Solid Waste Program are the increase of solid waste personnel training, initiation of new research, support of statewide planning, and technical assistance to local and state governments. The grantees and purposes for which the grants were given are listed.

66-0662
Four institutions receive solid waste grants. APWA [American Public Works Association] Reporter, 33(6):8, 1966.

Since technological obsolesence has been a major factor in the spread of unsanitary and inefficient waste disposal practices, the office of solid wastes has awarded grants to four institutions to train graduate engineers. Drexel Institute of Technology received $39,039; Georgia Institute of Technology, $33,254; University of Michigan, $40,129; and the University of Texas at Austin, $37,555.

66-0663
Health service grants will aid college solid waste research. Refuse Removal Journal, 9(9):22, 1966.

Over $820,000 in Federal funds has been awarded in 23 grants to 14 colleges, two cities, and two associations under the authority of the 1965 Solid Waste Disposal Act. Most of the projects (13) deal with health hazards arising from refuse disposal, rather than trying to improve the actual handling methods. Three grants will support technical meetings; and seven studies are to find out how to change waste materials into useful products. The largest proportion of the grant money (44%) will support research on incineration and residue handling methods, principally at the Drexel Institute of Technology, New York University, and Harvard University. The largest single grant went to the University of California at Berkeley to conduct a five-part solid waste study, including planning and economic factors, land use, sewer transport methods, and refuse treatment techniques. Other projects involve evaluation of paper refuse sacks in housefly control, landfill designs, and animal waste disposal.

66-0664
Incinerator technology course sponsored by engineer society. Refuse Removal Journal, 9(10):36, 1966.

A new lecture course is being given at the Adult Education Center, White Plains, New York, on incinerator technology. Designed for managers and operators of municipal refuse incinerator plants, air pollution and public health officials, designers, installation personnel and others, two-hourly classes a week are offered through December 14, 1966.

66-0665
The march of the PHS. Compost Science, 7(2):26-30, 1966.

The PHS has made grants for research, demonstration projects, training, and planning. APWA is developing courses. State waste disposal plans will be coordinated with planning for air and water pollution control and urban industrial development. Research is conducted to design products which generate less waste. Disposable bottles and plastic packaging create more problems than reusable bottles and paper packaging. Studies are conducted to recover heat from incinerators and to produce power for water desalination. Plants in Johnson City, Tennessee, and Gainesville, Florida, are studying composting. King County Sanitary Operations, Seattle, Washington, has received a grant to study high-pressure compression of garbage. Grinding garbage and mechanically agitating it in a column of rapidly moving air, is being investigated in Madison, Wisconsin. Santa Clara, California, received a grant for a process to reduce sanitary landfill health hazards by rapid decomposition of solid wastes.

66-0666
New course announced in solid-waste management. Modern Sanitation and Building Maintenance, 18(5):31, 1966.

A course was conducted at the U.S. Public Health Service's Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio, May 16-20, 1966, for training in solid-waste management. Topics included: problems, typical programs, storage practices, collection methods, on-site disposal, transfer stations, mineral and fuel production wastes, waste salvage, disposal methods, sanitary landfills, incinerators, and composting.

66-0667
Private industry aid sought for wastes. Refuse Removal Journal, 9(4):46, 1966.

Acting under the 1965 Solid Waste Disposal Act, the U.S. Bureau of Mines has asked companies that have research and development facilities, that may be able to solve the many solid waste disposal problems connected with fossil fuels, scrap metal, and other materials, to get detailed information on the subject from its offices. The U.S. Bureau of Mines will provide information to private industry relating to the disposal of such wastes as mine dumps, coal plant washings, mill tailings, slag banks, scrap metal, and fossilized organic wastes. Excluded from the Bureau's jurisdiction are wastes contributing primarily to water and air pollution, sewage, and other non-fossilized organic wastes. Further information may be obtained from the Division of Procurement and Property Management, Bureau of Mines, Department of the Interior, Washington, D.C. 20240.

66-0668

Research in solid waste disposal technology. Public Health Reports, 81(12):1091, 1966.

Twenty-three grants, totaling over $800,000, have been awarded by the Public Health Service in conjunction with the new Solid Waste Disposal Act. Twenty of these grants were awarded to expand the knowledge necessary to eliminate or reduce the health hazards from wastes. The primary goal in seven of the projects is information on the transformation of wastes into valuable by-products such as soil conditioners and fertilizers from animal wastes or charcoal, tars for highways, and boiler fuel from municipal refuse. New approaches to waste disposal, such as burning at sea to avoid onshore pollution, are the objectives of 13 projects to improve knowledge on the improvement of health protection. The financing of technical conferences to stimulate innovation in solid waste technology was the object of three grants. Steps have been initiated by the Office of Solid Wastes to support solid wastes instruction for graduate engineers at four colleges, and special courses are being provided for personnel from government and industry with responsibilities for waste disposal.

66-0669

Solid Wastes In Perspective; Proceedings; Symposium on Research Needs, Philadelphia, Pa., Jan. 28-29, 1966. Chicago, American Public Works Association. 18 p.

Solid wastes was selected as the subject matter for this first of a series of APWA symposia because of the enactment of the Solid Wastes Act of 1965. Twenty proposed research projects were discussed by participants representative of many diverse activities and professions. The two project suggestions considered most important are: the application of systems analysis, systems engineering, and operations research methods to the waste disposal field; and the development of adequate and reliable data relating to quantity and composition of solid wastes produced, as well as data relating to current collection and disposal operations. Other research suggestions which were recommended are: development of effective waste separation methods; improvement of the on-site waste storage container; improvement of incineration methods; evaluation of waste disposal in oceans and other deep bodies of water; research involving applications of biological and chemical treatments in waste disposal; development of new collection vehicles; and development of plans and blueprints for solving solid waste collection and disposal problems.

66-0670

Steed, H. C. Research grants for farm-waste disposal studies. In Management of Farm Animal Wastes; Proceedings; National Symposium on Animal Waste Management, East Lansing, Mich., May 5-7, 1966. St. Joseph, Mich., American Society of Agricultural Engineers. p.145-148.

A brief resume of the only active research projects sponsored by the Public Health Service in the agricultural wastes field, provides an insight into the type of project that has been proposed to date and for which support can be made available. The Public Health Service is seeking assistance and know-how on research and training problems in this field.

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